

Click to verify



A function relates an input to an output. It is like a machine that has an input and an output. And the output is related somehow to the input. $f(x) = \text{something}$ is the classic way of writing a function. And there are other ways, as you will see. We will see many ways to think about functions, but there are always three main parts: The input, the relationship, and the output. Here are the three parts: Input, Relationship, Output. $0, 2, 1, 2, 7, 14, 10, 20, \dots$. For an input of 0, 2, 7, 14, 10, 20, ... the output is 0, 5, 12, 19, 26, 33, 40, 47, 54, 61, 68, 75, 82, 89, 96, 103, 110, 117, 124, 131, 138, 145, 152, 159, 166, 173, 180, 187, 194, 201, 208, 215, 222, 229, 236, 243, 250, 257, 264, 271, 278, 285, 292, 299, 306, 313, 320, 327, 334, 341, 348, 355, 362, 369, 376, 383, 390, 397, 404, 411, 418, 425, 432, 439, 446, 453, 460, 467, 474, 481, 488, 495, 502, 509, 516, 523, 530, 537, 544, 551, 558, 565, 572, 579, 586, 593, 600, 607, 614, 621, 628, 635, 642, 649, 656, 663, 670, 677, 684, 691, 698, 705, 712, 719, 726, 733, 740, 747, 754, 761, 768, 775, 782, 789, 796, 803, 810, 817, 824, 831, 838, 845, 852, 859, 866, 873, 880, 887, 894, 901, 908, 915, 922, 929, 936, 943, 950, 957, 964, 971, 978, 985, 992, 999, 1006, 1013, 1020, 1027, 1034, 1041, 1048, 1055, 1062, 1069, 1076, 1083, 1090, 1097, 1104, 1111, 1118, 1125, 1132, 1139, 1146, 1153, 1160, 1167, 1174, 1181, 1188, 1195, 1202, 1209, 1216, 1223, 1230, 1237, 1244, 1251, 1258, 1265, 1272, 1279, 1286, 1293, 1300, 1307, 1314, 1321, 1328, 1335, 1342, 1349, 1356, 1363, 1370, 1377, 1384, 1391, 1398, 1405, 1412, 1419, 1426, 1433, 1440, 1447, 1454, 1461, 1468, 1475, 1482, 1489, 1496, 1503, 1510, 1517, 1524, 1531, 1538, 1545, 1552, 1559, 1566, 1573, 1580, 1587, 1594, 1601, 1608, 1615, 1622, 1629, 1636, 1643, 1650, 1657, 1664, 1671, 1678, 1685, 1692, 1699, 1706, 1713, 1720, 1727, 1734, 1741, 1748, 1755, 1762, 1769, 1776, 1783, 1790, 1797, 1804, 1811, 1818, 1825, 1832, 1839, 1846, 1853, 1860, 1867, 1874, 1881, 1888, 1895, 1902, 1909, 1916, 1923, 1930, 1937, 1944, 1951, 1958, 1965, 1972, 1979, 1986, 1993, 2000, 2007, 2014, 2021, 2028, 2035, 2042, 2049, 2056, 2063, 2070, 2077, 2084, 2091, 2098, 2105, 2112, 2119, 2126, 2133, 2140, 2147, 2154, 2161, 2168, 2175, 2182, 2189, 2196, 2203, 2210, 2217, 2224, 2231, 2238, 2245, 2252, 2259, 2266, 2273, 2280, 2287, 2294, 2301, 2308, 2315, 2322, 2329, 2336, 2343, 2350, 2357, 2364, 2371, 2378, 2385, 2392, 2399, 2406, 2413, 2420, 2427, 2434, 2441, 2448, 2455, 2462, 2469, 2476, 2483, 2490, 2497, 2504, 2511, 2518, 2525, 2532, 2539, 2546, 2553, 2560, 2567, 2574, 2581, 2588, 2595, 2602, 2609, 2616, 2623, 2630, 2637, 2644, 2651, 2658, 2665, 2672, 2679, 2686, 2693, 2700, 2707, 2714, 2721, 2728, 2735, 2742, 2749, 2756, 2763, 2770, 2777, 2784, 2791, 2798, 2805, 2812, 2819, 2826, 2833, 2840, 2847, 2854, 2861, 2868, 2875, 2882, 2889, 2896, 2903, 2910, 2917, 2924, 2931, 2938, 2945, 2952, 2959, 2966, 2973, 2980, 2987, 2994, 3001, 3008, 3015, 3022, 3029, 3036, 3043, 3050, 3057, 3064, 3071, 3078, 3085, 3092, 3099, 3106, 3113, 3120, 3127, 3134, 3141, 3148, 3155, 3162, 3169, 3176, 3183, 3190, 3197, 3204, 3211, 3218, 3225, 3232, 3239, 3246, 3253, 3260, 3267, 3274, 3281, 3288, 3295, 3302, 3309, 3316, 3323, 3330, 3337, 3344, 3351, 3358, 3365, 3372, 3379, 3386, 3393, 3400, 3407, 3414, 3421, 3428, 3435, 3442, 3449, 3456, 3463, 3470, 3477, 3484, 3491, 3498, 3505, 3512, 3519, 3526, 3533, 3540, 3547, 3554, 3561, 3568, 3575, 3582, 3589, 3596, 3603, 3610, 3617, 3624, 3631, 3638, 3645, 3652, 3659, 3666, 3673, 3680, 3687, 3694, 3701, 3708, 3715, 3722, 3729, 3736, 3743, 3750, 3757, 3764, 3771, 3778, 3785, 3792, 3799, 3806, 3813, 3820, 3827, 3834, 3841, 3848, 3855, 3862, 3869, 3876, 3883, 3890, 3897, 3904, 3911, 3918, 3925, 3932, 3939, 3946, 3953, 3960, 3967, 3974, 3981, 3988, 3995, 4002, 4009, 4016, 4023, 4030, 4037, 4044, 4051, 4058, 4065, 4072, 4079, 4086, 4093, 4100, 4107, 4114, 4121, 4128, 4135, 4142, 4149, 4156, 4163, 4170, 4177, 4184, 4191, 4198, 4205, 4212, 4219, 4226, 4233, 4240, 4247, 4254, 4261, 4268, 4275, 4282, 4289, 4296, 4303, 4310, 4317, 4324, 4331, 4338, 4345, 4352, 4359, 4366, 4373, 4380, 4387, 4394, 4401, 4408, 4415, 4422, 4429, 4436, 4443, 4450, 4457, 4464, 4471, 4478, 4485, 4492, 4499, 4506, 4513, 4520, 4527, 4534, 4541, 4548, 4555, 4562, 4569, 4576, 4583, 4590, 4597, 4604, 4611, 4618, 4625, 4632, 4639, 4646, 4653, 4660, 4667, 4674, 4681, 4688, 4695, 4702, 4709, 4716, 4723, 4730, 4737, 4744, 4751, 4758, 4765, 4772, 4779, 4786, 4793, 4800, 4807, 4814, 4821, 4828, 4835, 4842, 4849, 4856, 4863, 4870, 4877, 4884, 4891, 4898, 4905, 4912, 4919, 4926, 4933, 4940, 4947, 4954, 4961, 4968, 4975, 4982, 4989, 4996, 5003, 5010, 5017, 5024, 5031, 5038, 5045, 5052, 5059, 5066, 5073, 5080, 5087, 5094, 5101, 5108, 5115, 5122, 5129, 5136, 5143, 5150, 5157, 5164, 5171, 5178, 5185, 5192, 5199, 5206, 5213, 5220, 5227, 5234, 5241, 5248, 5255, 5262, 5269, 5276, 5283, 5290, 5297, 5304, 5311, 5318, 5325, 5332, 5339, 5346, 5353, 5360, 5367, 5374, 5381, 5388, 5395, 5402, 5409, 5416, 5423, 5430, 5437, 5444, 5451, 5458, 5465, 5472, 5479, 5486, 5493, 5500, 5507, 5514, 5521, 5528, 5535, 5542, 5549, 5556, 5563, 5570, 5577, 5584, 5591, 5598, 5605, 5612, 5619, 5626, 5633, 5640, 5647, 5654, 5661, 5668, 5675, 5682, 5689, 5696, 5703, 5710, 5717, 5724, 5731, 5738, 5745, 5752, 5759, 5766, 5773, 5780, 5787, 5794, 5801, 5808, 5815, 5822, 5829, 5836, 5843, 5850, 5857, 5864, 5871, 5878, 5885, 5892, 5899, 5906, 5913, 5920, 5927, 5934, 5941, 5948, 5955, 5962, 5969, 5976, 5983, 5990, 5997, 6004, 6011, 6018, 6025, 6032, 6039, 6046, 6053, 6060, 6067, 6074, 6081, 6088, 6095, 6102, 6109, 6116, 6123, 6130, 6137, 6144, 6151, 6158, 6165, 6172, 6179, 6186, 6193, 6200, 6207, 6214, 6221, 6228, 6235, 6242, 6249, 6256, 6263, 6270, 6277, 6284, 6291, 6298, 6305, 6312, 6319, 6326, 6333, 6340, 6347, 6354, 6361, 6368, 6375, 6382, 6389, 6396, 6403, 6410, 6417, 6424, 6431, 6438, 6445, 6452, 6459, 6466, 6473, 6480, 6487, 6494, 6501, 6508, 6515, 6522, 6529, 6536, 6543, 6550, 6557, 6564, 6571, 6578, 6585, 6592, 6599, 6606, 6613, 6620, 6627, 6634, 6641, 6648, 6655, 6662, 6669, 6676, 6683, 6690, 6697, 6704, 6711, 6718, 6725, 6732, 6739, 6746, 6753, 6760, 6767, 6774, 6781, 6788, 6795, 6802, 6809, 6816, 6823, 6830, 6837, 6844, 6851, 6858, 6865, 6872, 6879, 6886, 6893, 6900, 6907, 6914, 6921, 6928, 6935, 6942, 6949, 6956, 6963, 6970, 6977, 6984, 6991, 6998, 7005, 7012, 7019, 7026, 7033, 7040, 7047, 7054, 7061, 7068, 7075, 7082, 7089, 7096, 7103, 7110, 7117, 7124, 7131, 7138, 7145, 7152, 7159, 7166, 7173, 7180, 7187, 7194, 7201, 7208, 7215, 7222, 7229, 7236, 7243, 7250, 7257, 7264, 7271, 7278, 7285, 7292, 7299, 7306, 7313, 7320, 7327, 7334, 7341, 7348, 7355, 7362, 7369, 7376, 7383, 7390, 7397, 7404, 7411, 7418, 7425, 7432, 7439, 7446, 7453, 7460, 7467, 7474, 7481, 7488, 7495, 7502, 7509, 7516, 7523, 7530, 7537, 7544, 7551, 7558, 7565, 7572, 7579, 7586, 7593, 7600, 7607, 7614, 7621, 7628, 7635, 7642, 7649, 7656, 7663, 7670, 7677, 7684, 7691, 7698, 7705, 7712, 7719, 7726, 7733, 7740, 7747, 7754, 7761, 7768, 7775, 7782, 7789, 7796, 7803, 7810, 7817, 7824, 7831, 7838, 7845, 7852, 7859, 7866, 7873, 7880, 7887, 7894, 7901, 7908, 7915, 7922, 7929, 7936, 7943, 7950, 7957, 7964, 7971, 7978, 7985, 7992, 7999, 8006, 8013, 8020, 8027, 8034, 8041, 8048, 8055, 8062, 8069, 8076, 8083, 8090, 8097, 8104, 8111, 8118, 8125, 8132, 8139, 8146, 8153, 8160, 8167, 8174, 8181, 8188, 8195, 8202, 8209, 8216, 8223, 8230, 8237, 8244, 8251, 8258, 8265, 8272, 8279, 8286, 8293, 8300, 8307, 8314, 8321, 8328, 8335, 8342, 8349, 8356, 8363, 8370, 8377, 8384, 8391, 8398, 8405, 8412, 8419, 8426, 8433, 8440, 8447, 8454, 8461, 8468, 8475, 8482, 8489, 8496, 8503, 8510, 8517, 8524, 8531, 8538, 8545, 8552, 8559, 8566, 8573, 8580, 8587, 8594, 8601, 8608, 8615, 8622, 8629, 8636, 8643, 8650, 8657, 8664, 8671, 8678, 8685, 8692, 8699, 8706, 8713, 8720, 8727, 8734, 8741, 8748, 8755, 8762, 8769, 8776, 8783, 8790, 8797, 8804, 8811, 8818, 8825, 8832, 8839, 8846, 8853, 8860, 8867, 8874, 8881, 8888, 8895, 8902, 8909, 8916, 8923, 8930, 8937, 8944, 8951, 8958, 8965, 8972, 8979, 8986, 8993, 9000, 9007, 9014, 9021, 9028, 9035, 9042, 9049, 9056, 9063, 9070, 9077, 9084, 9091, 9098, 9105, 9112, 9119, 9126, 9133, 9140, 9147, 9154, 9161, 9168, 9175, 9182, 9189, 9196, 9203, 9210, 9217, 9224, 9231, 9238, 9245, 9252, 9259, 9266, 9273, 9280, 9287, 9294, 9301, 9308, 9315, 9322, 9329, 9336, 9343, 9350, 9357, 9364, 9371, 9378, 9385, 9392, 9399, 9406, 9413, 9420, 9427, 9434, 9441, 9448, 9455, 9462, 9469, 9476, 9483, 9490, 9497, 9504, 9511, 9518, 9525, 9532, 9539, 9546, 9553, 9560, 9567, 9574, 9581, 9588, 9595, 9602, 9609, 9616, 9623, 9630, 9637, 9644, 9651, 9658, 9665, 9672, 9679, 9686, 9693, 9700, 9707, 9714, 9721, 9728, 9735, 9742, 9749, 9756, 9763, 9770, 9777, 9784, 9791, 9798, 9805, 9812, 9819, 9826, 9833, 9840, 9847, 9854, 9861, 9868, 9875, 9882, 9889, 9896, 9903, 9910, 9917, 9924, 9931, 9938, 9945, 9952, 9959, 9966, 9973, 9980, 9987, 9994, 10001, 10008, 10015, 10022, 10029, 10036, 10043, 10050, 10057, 10064, 10071, 10078, 10085, 10092, 10099, 10106, 10113, 10120, 10127, 10134, 10141, 10148, 10155, 10162, 10169, 10176, 10183, 10190, 10197, 10204, 10211, 10218, 10225, 10232, 10239, 10246, 10253, 10260, 10267, 10274, 10281, 10288, 10295, 10302, 10309, 10316, 10323, 10330, 10337, 10344, 10351, 10358, 10365, 10372, 10379, 10386, 10393, 10400, 10407, 10414, 10421, 10428, 10435, 10442, 10449, 10456, 10463, 10470, 10477, 10484, 10491, 10498, 10505, 10512, 10519, 10526, 10533, 10540, 10547, 10554, 10561, 10568, 10575, 10582, 10589, 10596, 10603, 10610, 10617, 10624, 10631, 10638, 10645, 10652, 10659, 10666, 10673, 10680, 10687, 10694, 10701, 10708, 10715, 10722, 10729, 10736, 10743, 10750, 10757, 10764, 10771, 10778, 10785, 10792, 10799, 10806, 10813, 10820, 10827, 10834, 10841, 10848, 10855, 10862, 10869, 10876, 10883, 10890, 10897, 10904, 10911, 10918, 10925, 10932, 10939, 10946, 10953, 10960, 10967, 10974, 10981, 10988, 10995, 11002, 11009, 11016, 11023, 11030, 11037, 11044, 11051, 11058, 11065, 11072, 11079, 11086, 11093, 11100, 11107, 11114, 11121, 11128, 11135, 11142, 11149, 11156, 11163, 11170, 11177, 11184, 11191, 11198, 11205, 11212, 11219, 11226, 11233, 11240, 11247, 11254, 11261, 11268, 11275, 11282, 11289, 11296, 11303, 11310, 11317, 11324, 11331, 11338, 11345, 11352, 11359, 11366, 11373, 11380, 11387, 11394, 11401, 11408, 11415, 11422, 11429, 11436, 11443, 11450, 11457, 11464, 11471, 11478, 11485, 11492, 11499, 11506, 11513, 11520, 11527, 11534, 11541, 11548, 11555, 11562, 11569, 11576, 11583, 11590, 11597, 11604, 11611, 11618, 11625, 11632, 11639, 11646, 11653, 11660, 11667, 11674, 11681, 11688, 11695, 11702, 11709, 11716, 11723, 11730, 11737, 11744, 11751, 11758, 11765, 11772, 11779, 11786, 11793, 11800, 11807, 11814, 11821, 11828, 11835, 11842, 11849, 11856, 11863, 11870, 11877, 11884, 11891, 11898, 11905, 11912, 11919, 11926, 11933, 11940, 11947, 11954, 11961, 11968, 11975, 11982, 11989, 11996, 12003, 12010, 12017, 12024, 12031, 12038, 12045, 12052, 12059, 12066, 12073, 12080, 12087, 12094, 12101, 12108, 12115, 12122, 12129, 12136, 12143, 12150, 12157, 12164, 12171, 12178, 12185, 12192, 12199, 12206, 12213, 12220, 12227, 12234, 12241, 12248, 12255, 12262, 12269, 12276, 12283, 12290, 12297, 12304, 12311, 12318, 12325, 12332, 12339, 12346, 12353, 12360, 12367, 12374, 12381, 12388, 12395, 12402, 12409, 12416, 12423, 12430, 12437, 12444, 12451, 12458, 12465, 12472, 12479, 12486, 12493, 12500, 12507, 12514, 12521, 12528, 12535, 12542, 12549, 12556, 12563, 12570, 12577, 12584, 12591, 12598, 12605, 12612, 12619, 12626, 12633, 12640, 12647, 12654, 12661, 12668, 12675, 12682, 12689, 12696, 12703, 12710, 12717, 12724, 12731, 12738, 12745, 12752, 12759, 12766, 12773, 12780, 12787, 12794, 12801, 12808, 12815, 12822, 12829, 12836, 12843, 12850, 12857, 12864, 12871, 12878, 12885, 12892, 12899, 12906, 12913, 12920, 12927, 12934, 12941, 12948, 12955, 12962, 12969, 12976, 12983, 12990, 12997, 13004, 13011, 13018, 13025, 13032, 13039, 13046, 13053, 13060, 13067, 13074, 13081, 13088, 13095, 13102, 13109, 13116, 13123, 13130, 13137, 13144, 13151, 13158, 13165, 13172, 13179, 13186, 13193, 13200, 13207, 13214, 13221, 13228, 13235, 13242, 13249, 13256, 13263, 13270, 13277, 13284, 13291, 13298, 13305, 13312, 13319, 13326, 13333, 13340, 13347, 13354, 13361, 13368, 13375, 13382, 13389, 13396, 13403, 13410, 13417, 13424, 13431, 13438, 13445, 13452, 13459, 13466, 13473, 13480, 13487, 13494, 13501, 13508, 13515, 13522, 13529, 13536, 13543, 13550, 13557, 13564, 13571, 13578, 13585, 13592, 13599, 13606, 13613, 13620, 13627, 13634, 13641, 13648, 13655, 13662, 13669, 13676, 13683, 13690, 13697, 13704, 13711, 13718, 13725, 13732, 13739, 13746, 13753, 13760, 13767,

definition of function was first given in 1837 by the German mathematician Peter Dirichlet:If a variable *y* is so related to a variable *x* that whenever a numerical value is assigned to *x*, there is a rule according to which a unique value of *y* is determined, then *y* is said to be a function of the independent variable *x*.This relationship is commonly symbolized as *y* = *f*(*x*),which is said to read *y* an *x* are related such that for every *x*, there is a unique value of *y*. That is, *f*(*x*) can not have more than one value for the same *x*. To use the language of set theory, a function relates an element *x* to an element *f*(*x*) in another set. The set of values of *x* is called the domain of the function, and the set of values of *f*(*x*) generated by the values in the domain is called the range of the function. In addition to *f*(*x*), other abbreviated symbols such as *g*(*x*) and *P*(*x*) are often used to represent functions of the independent variable *x*, especially when the nature of the function is unknown or unspecified. Many widely used mathematical formulas are expressions of known functions. For example, the formula for the area of a circle, *A* = *r*², gives the dependent variable *A* (the area) as a function of the independent variable *r* (the radius). Functions involving more than two variables (called multivariable or multivariate functions) also are common in mathematics, as can be seen in the formula for the area of a triangle, *A* = *b**h*/*2*, which defines *A* as a function of both *b* (base) and *h* (height). In these examples, physical constraints force the independent variables to be positive numbers. When the independent variables are also allowed to take on negative values, any real number functions are known as real-valued functions. The formula for the area of a circle is an example of a polynomial function. The general form for such functions is *P*(*x*) = *a*0 + *a*1*x* + *a*2*x*²+...+ *a**n**x*^{*n*}, where the coefficients (*a*0, *a*1, *a*2, ..., *a**n*) are given, *x* can be any real number, and all the powers of *x* are counting numbers (1, 2, 3,...). (When the powers of *x* can be any real number, the result is known as an algebraic function.) Polynomial functions have been studied since the earliest times because of their versatilitypractically any relationship involving real numbers can be closely approximated by a polynomial function. Polynomial functions are characterized by the highest power of the independent variable. Special names are commonly used for such powers from one to five:linear, quadratic, cubic, quartic, and quintic for the highest powers being 1, 2, 3, 4, and 5, respectively. Polynomial functions may be given geometric representation by means of analytic geometry. The independent variable *x* is plotted along the *x*-axis (a horizontal line), and the dependent variable *y* is plotted along the *y*-axis (a vertical line). When the graph of a relation between *x* and *y* is plotted in the *x-y* plane, the relation is a function if a vertical line always passes through only one point of the graphed curve; that is, there would be only one point *f*(*x*) corresponding to each *x*, which is the definition of a function. The graph of the function then consists of the points with coordinates (*x*, *y*) where *y* = *f*(*x*). For example, the graph of the cubic equation *f*(*x*) = *x*³ 3*x* + 2 is shown in the figure. Graphs of some trigonometric functionsNote that each of these functions is periodic. Thus, the sine and cosine functions repeat every 2, and the tangent and cotangent functions repeat every. Another common type of function that has been studied since antiquity is the trigonometric functions, such as sin *x* and cos *x*, where *x* is the measure of an angle (see figure). Because of their periodic nature, trigonometric functions are often used to model behaviour that repeats, or cycles. The exponential function is a relation of the form *y* = *a*^{*x*}, with the independent variable *x* ranging over the entire real number line as the exponent of a positive number *a*. Probably the most important of the exponential functions is *y* = *e*^{*x*}, sometimes written *y* = exp (*x*), in which *e* (2.7182818) is the base of the natural system of logarithms (ln). By definition *x* is a logarithm, and there is thus a logarithmic function that is the inverse of the exponential function. Specifically, if *y* = *e*^{*x*}, then *x* = ln *y*. Nonalgebraic functions, such as exponential and trigonometric functions, are also known as transcendental functions, which can be located by a single signed (positive or negative) number along a number line, complex numbers require a plane with two axes, one axis for the real number component and one axis for the imaginary component. Although the complex plane looks like the ordinary two-dimensional plane, where each point is determined by an ordered pair of real numbers (*x*, *y*), the point *x* + *i**y* is a single number.Practical applications of functions whose variables are complex numbers are not so easy to illustrate, but they are nevertheless very extensive. They occur, for example, in electrical engineering and aerodynamics. If the complex variable is represented in the form *z* = *x* + *i**y*, where *i* is the imaginary unit (the square root of 1) and *x* and *y* are real variables (see figure), it is possible to split the complex function into real and imaginary parts: *f*(*z*) = *P*(*x*, *y*) + *i**Q*(*x*, *y*). Show Mobile Notice Show All Notices Hide All Notices Mobile Notice You appear to be on a device with a "narrow" screen width (i.e. you are probably on a mobile phone). Due to the nature of the mathematics on this site it is best viewed in landscape mode. If your device is not in landscape mode many of the equations will run off the side of your device (you should be able to scroll/swipe to see them) and some of the menu items will be cut off due to the narrow screen width. Here are my online notes for my Algebra course that I teach here at Lamar University, although I have to admit that it's been years since I last taught this course. At this point in my career I mostly teach Calculus and Differential Equations. Despite the fact that these are my class notes, they should be accessible to anyone wanting to learn Algebra or needing a refresher for Algebra. I've tried to make the notes as self contained as possible and do not reference any book. However, they do assume that youve had some exposure to the basics of algebra at some point prior to this. While there is some review of exponents, factoring and graphing it is assumed that not a lot of review will be needed to remind you how these topics work. Here are a couple of warnings to my students who may be here to get a copy of what happened on a day that you missed. Because I wanted to make this a fairly complete set of notes for anyone wanting to learn algebra I have included some material that I do not usually have time to cover in class and because this changes from semester to semester it is not noted here. You will need to find one of your fellow class mates to see if there is something in these notes that wasnt covered in class. Because I want these notes to provide some more examples for you to read through, I dont always work the same problems in class as those given in the notes. Likewise, even if I do work some of the problems in here I may work fewer problems in class than are presented here. Sometimes questions in class will lead down paths that are not covered here. I try to anticipate as many of the questions as possible when writing these up, but the reality is that I cant anticipate all the questions. Sometimes a very good question gets asked in class that leads to insights that Ive not included here. You should always talk to someone who was in class on the day you missed and compare these notes to their notes and see what the differences are. This is somewhat related to the previous three items, but is important enough to merit its own item. THESE NOTES ARE NOT A SUBSTITUTE FOR ATTENDING CLASS!! Using these notes as a substitute for class is liable to get you in trouble. As already noted not everything in these notes is covered in class and often material or insights not in these notes is covered in class. Here is a listing (and brief description) of the material that is in this set of notes. Preliminaries - In this chapter we will do a quick review of some topics that are absolutely essential to being successful in an Algebra class. We review exponents (integer and rational), radicals, polynomials, factoring polynomials, rational expressions and complex numbers. Integer Exponents In this section we will start looking at exponents. We will give the basic properties of exponents and illustrate some of the common mistakes students make in working with exponents. Examples in this section we will be restricted to integer exponents. Rational exponents will be discussed in the next section. Rational Exponents In this section we will define what we mean by a rational exponent and extend the properties from the previous section to rational exponents. We will also discuss how to evaluate numbers raised to a rational exponent. Radicals In this section we will define radical notation and relate radicals to rational exponents. We will also give the properties of radicals and some of the common mistakes students often make with radicals. We will also define simplified radical form and show how to rationalize the denominator. Polynomials In this section we will introduce the basics of polynomials a topic that will appear throughout this course. We will define the degree of a polynomial and discuss how to add, subtract and multiply polynomials. Factoring Polynomials In this section we look at factoring polynomials a topic that will appear in pretty much every chapter in this course and so is vital that you understand it. We will discuss factoring out the greatest common factor, factoring by grouping, factoring quadratics and factoring polynomials with degree greater than 2. Rational Expressions In this section we will define rational expressions. We will discuss how to reduce a rational expression lowest terms and how to add, subtract, multiply and divide rational expressions. Complex Numbers In this section we give a very quick primer on complex numbers including standard form, adding, subtracting, multiplying and dividing them. Solving Equations and Inequalities - In this chapter we will look at one of the most important topics of the class: The ability to solve equations and inequalities is vital to surviving this class and many of the later math classes you might take. We will discuss solving linear and quadratic equations as well as applications. In addition, we will discuss solving polynomial and rational inequalities as well as absolute value equations and inequalities. Solutions and Solution Sets In this section we introduce some of the basic notation and ideas involved in solving equations and inequalities. We define solutions for equations and inequalities and solution sets. Linear Equations In this section we give a process for solving linear equations, including equations with rational expressions, and we illustrate the process with several examples. In addition, we discuss a subtlety involved in solving equations that students often overlook. Applications of Linear Equations In this section we discuss a process for solving applications in general although we will focus only on linear equations here. We will work applications in pricing, distance/rate problems, work rate problems and mixing problems. Equations With More Than One Variable In this section we will look at solving equations with more than one variable in them. These equations will have multiple variables in them and we will be asked to solve the equation for one of the variables. This is something that we will be asked to do on a fairly regular basis. Quadratic Equations, Part I In this section we will start looking at solving quadratic equations. Specifically, we will look at factoring and the square root property in this section. Quadratic Equations, Part II In this section we will continue solving quadratic equations. We will use completing the square to solve quadratic equations in this section and use that to derive the quadratic formula. The quadratic formula is a quick way that will allow us to quickly solve any quadratic equation. Quadratic Equations : A Summary In this section we will summarize the topics from the last two sections. We will give a procedure for determining which method to use in solving quadratic equations and we will define the discriminant which will allow us to quickly determine what kind of solutions we will get from solving a quadratic equation. Applications of Quadratic Equations In this section we will revisit some of the applications we saw in the linear application section, only this time they will involve solving a quadratic equation. Included are examples in distance/rate problems and work rate problems. Equations Reducible to Quadratic Form Not all equations are in what we generally consider quadratic equations. However, some equations, with a proper substitution can be turned into a quadratic equation. These types of equations are called quadratic in form. In this section we will solve this type of equation. Equations with Radicals In this section we will discuss how to solve equations with square roots in them. As we will see we will need to be very careful with the potential solutions we get as the process used in solving these equations can lead to values that are not, in fact, solutions to the equation. Linear Inequalities In this section we will start solving inequalities. We will concentrate on solving linear inequalities in this section (both single and double inequalities). We will also introduce interval notation. Polynomial Inequalities In this section we will continue solving inequalities. However, in this section we move away from linear inequalities and move on to solving inequalities that involve polynomials of degree at least 2. Rational Inequalities We continue solving inequalities in this section. We now will solve inequalities that involve rational expressions, although as well see the process here is pretty much identical to the process used when solving inequalities with polynomials. Absolute Value Equations In this section we will give a geometric as well as a mathematical definition of absolute value. We will then proceed to solve equations that involve an absolute value. We will also work an example that involved two absolute values. Absolute Value Inequalities In this final section of the Solving chapter we will solve inequalities that involve absolute value. As we will see the process for solving inequalities with a \(\) (i.e. greater than). Graphing and Functions - In this chapter well look at two very important topics in an Algebra class. First, we will start discussing graphing equations by introducing the Cartesian (or Rectangular) coordinates system and illustrating use of the coordinate system to graph lines and circles. We will also formally define a function and discuss graph functions and combining functions. We will also discuss inverse functions. Graphing In this section we will introduce the Cartesian (or Rectangular) coordinate system. We will define/introduce ordered pairs, coordinates, quadrants, and *x* and *y*-intercepts. We will illustrate these concepts with a couple of quick examples Lines In this section we will discuss graphing lines. We will introduce the concept of slope and discuss how to find it from two points on the line. In addition, we will introduce the standard form of the line as well as the point-slope form and slope-intercept form of the line. We will finish off the section with a discussion on parallel and perpendicular lines. Circles In this section we discuss graphing circles. We introduce the standard form of the circle and show how to use completing the square to put an equation of a circle into standard form. The Definition of a Function In this section we will formally define relations and functions. We also give a working definition of a function to help understand just what a function is. We introduce function notation and work several examples illustrating how it works. We also define the domain and range of a function. In addition, we introduce piecewise functions in this section. Graphing Functions In this section we discuss graphing functions including several examples of graphing piecewise functions. Combining functions In this section we will discuss how to add, subtract, multiply and divide functions. In addition, we introduce the concept of function composition. Inverse Functions In this section we define one-to-one and inverse functions. We also discuss a process we can use to find an inverse function and verify that the function we get from this process is, in fact, an inverse function. Common Graphs - In this chapter we will look at graphing some of the more common functions you might be asked to graph. We graph parabolas, ellipses, hyperbolas and rational functions in this chapter. We will also look at transformations of functions and introduce the concept of symmetry. Lines, Circles and Piecewise Functions This section is here only to acknowledge that weve already talked about graphing these in a previous chapter. Parabolas In this section we will be graphing parabolas. We introduce the vertex and axis of symmetry for a parabola and give a process for graphing parabolas. We also illustrate how to use completing the square to put the parabola into the form \((f(x)-a)=(x-h)^2 +k\). Ellipses In this section we will graph ellipses. We introduce the standard form of an ellipse and how to use it to quickly graph an ellipse. Hyperbolas In this section we will graph hyperbolas. We introduce the standard form of a hyperbola and how to use it to quickly graph a hyperbola. Miscellaneous Functions In this section we will graph a couple of common functions that dont really take all that much work to do but will be needed in later sections. Well be looking at the constant function, square root, absolute value and a simple cubic function. Transformations In this section we will be looking at vertical and horizontal shifts of graphs as well as reflections of graphs about the (x) and (y)-axis. Collectively these are often called transformations and if we understand them they can often be used to allow us to quickly graph some fairly complicated functions. Symmetry In this section we introduce the idea of symmetry. We discuss symmetry about the *x*-axis, *y*-axis and the origin and we give methods for determining what, if any symmetry, a graph will have without having to actually graph the function. Rational Functions In this section we will discuss a process for graphing rational functions. We will also introduce the ideas of vertical and horizontal asymptotes as well as how to determine if the graph of a rational function will have them. Polynomial Functions - In this chapter we will take a more detailed look at polynomial functions. We will discuss dividing polynomials, finding zeroes of polynomials and sketching the graph of polynomials. We will also look at partial fractions (even though this doesnt really involve polynomial functions). Dividing Polynomials In this section well review some of the basics of dividing polynomials. We will define the remainder and divisor used in the division process and introduce the idea of synthetic division. We will also give the Division Algorithm. Zeros/Roots of Polynomials In this section well define the zero or root of a polynomial and whether or not it is a simple root or has multiplicity (k). We will also give the Fundamental Theorem of Algebra and The Factor Theorem as well as a couple of other useful facts. Graphing Polynomials In this section we will give a process that will allow us to get a rough sketch of the graph of some polynomials. We discuss how to determine the behavior of the graph at (x)-intercepts and the leading coefficient test to determine the behavior of the graph as we allow *x* to increase and decrease without bound. Finding Zeros of Polynomials As we saw in the previous section in order to sketch the graph of a polynomial we need to know what its zeroes are. However, if we are not able to factor the polynomial we are unable to do that process. So, in this section well look at a process using the Rational Root Theorem that will allow us to find some of the zeroes of a polynomial and in special cases all of the zeroes. Partial Fractions In this section we will take a look at the process of partial fractions and finding the partial fraction decomposition of a rational expression. What we will be asking here is what smaller rational expressions did we add and/or subtract to get the given rational expression. This is a process that has a lot of uses in some later math classes. It can show up in Calculus and Differential Equations for example. Exponential and Logarithm Functions - In this chapter we will introduce two very important functions in many areas : the exponential and logarithm functions. We will look at their basic properties, applications and solving equations involving the two functions. If you are in a field that takes you into the sciences or engineering then you will be running into both of these functions. Exponential Functions In this section we will introduce exponential functions. We will give some of the basic properties and graphs of exponential functions. We will also discuss what many people consider to be the exponential function, $f(x) = \{bf e^x\} (x \in \mathbb{R})$. Logarithm Functions In this section we will introduce logarithm functions. We give the basic properties and graphs of logarithm functions. In addition, we discuss how to evaluate some basic logarithms including the use of the change of base formula. We will also discuss the common logarithm, $f(x) = \log(x)$, and the natural logarithm, $f(x) = \ln(x)$. Solving Exponential Equations In this section we will discuss a couple of methods for solving equations that contain exponentials. Solving Logarithm Equations In this section we will discuss a couple of methods for solving equations that contain logarithms. Theorem as well as several useful facts. Graphing Parabolas In this section we will be graphing parabolas. We introduce the vertex and axis of symmetry for a parabola and give a process for graphing parabolas. We also illustrate how to use completing the square to put the parabola into the form $f(x) = a(x-h)^2 + k$. Ellipses In this section we will graph ellipses. We introduce the standard form of an ellipse and how to use it to quickly graph an ellipse. Hyperbolas In this section we will graph hyperbolas. We introduce the standard form of a hyperbola and how to use it to quickly graph a hyperbola. Miscellaneous Functions In this section we will graph a couple of common functions that dont really take all that much work to do but will be needed in later sections. Well be looking at the constant function, square root, absolute value and a simple cubic function. Transformations In this section we will be looking at vertical and horizontal shifts of graphs as well as reflections of graphs about the (x) and (y)-axis. Collectively these are often called transformations and if we understand them they can often be used to allow us to quickly graph some fairly complicated functions. Symmetry In this section we introduce the idea of symmetry. We discuss symmetry about the *x*-axis, *y*-axis and the origin and we give methods for determining what, if any symmetry, a graph will have without having to actually graph the function. Rational Functions In this section we will discuss a process for graphing rational functions. We will also introduce the ideas of vertical and horizontal asymptotes as well as how to determine if the graph of a rational function will have them. Polynomial Functions - In this chapter we will take a more detailed look at polynomial functions. We will discuss dividing polynomials, finding zeroes of polynomials and sketching the graph of polynomials. We will also look at partial fractions (even though this doesnt really involve polynomial functions). Dividing Polynomials In this section well review some of the basics of dividing polynomials. We will define the remainder and divisor used in the division process and introduce the idea of synthetic division. We will also give the Division Algorithm. Zeros/Roots of Polynomials In this section well define the zero or root of a polynomial and whether or not it is a simple root or has multiplicity (k). We will also give the Fundamental Theorem of Algebra and The Factor Theorem as well as a couple of other useful facts. Graphing Polynomials In this section we will give a process that will allow us to get a rough sketch of the graph of some polynomials. We discuss how to determine the behavior of the graph at (x)-intercepts and the leading coefficient test to determine the behavior of the graph as we allow *x* to increase and decrease without bound. Finding Zeros of Polynomials As we saw in the previous section in order to sketch the graph of a polynomial we need to know what its zeroes are. However, if we are not able to factor the polynomial we are unable to do that process. So, in this section well look at a process using the Rational Root Theorem that will allow us to find some of the zeroes of a polynomial and in special cases all of the zeroes. Partial Fractions In this section we will take a look at the process of partial fractions and finding the partial fraction decomposition of a rational expression. What we will be asking here is what smaller rational expressions did we add and/or subtract to get the given rational expression. This is a process that has a lot of uses in some later math classes. It can show up in Calculus and Differential Equations for example. Exponential and Logarithm Functions - In this chapter we will introduce two very important functions in many areas : the exponential and logarithm functions. We will look at their basic properties, applications and solving equations involving the two functions. If you are in a field that takes you into the sciences or engineering then you will be running into both of these functions. Exponential Functions In this section we will introduce exponential functions. We will give some of the basic properties and graphs of exponential functions. We will also discuss what many people consider to be the exponential function, $f(x) = \{bf e^x\} (x \in \mathbb{R})$. Logarithm Functions In this section we will introduce logarithm functions. We give the basic properties and graphs of logarithm functions. In addition, we discuss how to evaluate some basic logarithms including the use of the change of base formula. We will also discuss the common logarithm, $f(x) = \log(x)$, and the natural logarithm, $f(x) = \ln(x)$. Solving Exponential Equations In this section we will discuss a couple of methods for solving equations that contain exponentials. Solving Logarithm Equations In this section we will discuss a couple of methods for solving equations that contain logarithms. Theorem as well as several useful facts. Graphing Parabolas In this section we will be graphing parabolas. We introduce the vertex and axis of symmetry for a parabola and give a process for graphing parabolas. We also illustrate how to use completing the square to put the parabola into the form $f(x) = a(x-h)^2 + k$. Ellipses In this section we will graph ellipses. We introduce the standard form of an ellipse and how to use it to quickly graph an ellipse. Hyperbolas In this section we will graph hyperbolas. We introduce the standard form of a hyperbola and how to use it to quickly graph a hyperbola. Miscellaneous Functions In this section we will graph a couple of common functions that dont really take all that much work to do but will be needed in later sections. Well be looking at the constant function, square root, absolute value and a simple cubic function. Transformations In this section we will be looking at vertical and horizontal shifts of graphs as well as reflections of graphs about the (x) and (y)-axis. Collectively these are often called transformations and if we understand them they can often be used to allow us to quickly graph some fairly complicated functions. Symmetry In this section we introduce the idea of symmetry. We discuss symmetry about the *x*-axis, *y*-axis and the origin and we give methods for determining what, if any symmetry, a graph will have without having to actually graph the function. Rational Functions In this section we will discuss a process for graphing rational functions. We will also introduce the ideas of vertical and horizontal asymptotes as well as how to determine if the graph of a rational function will have them. Polynomial Functions - In this chapter we will take a more detailed look at polynomial functions. We will discuss dividing polynomials, finding zeroes of polynomials and sketching the graph of polynomials. We will also look at partial fractions (even though this doesnt really involve polynomial functions). Dividing Polynomials In this section well review some of the basics of dividing polynomials. We will define the remainder and divisor used in the division process and introduce the idea of synthetic division. We will also give the Division Algorithm. Zeros/Roots of Polynomials In this section well define the zero or root of a polynomial and whether or not it is a simple root or has multiplicity (k). We will also give the Fundamental Theorem of Algebra and The Factor Theorem as well as a couple of other useful facts. Graphing Polynomials In this section we will give a process that will allow us to get a rough sketch of the graph of some polynomials. We discuss how to determine the behavior of the graph at (x)-intercepts and the leading coefficient test to determine the behavior of the graph as we allow *x* to increase and decrease without bound. Finding Zeros of Polynomials As we saw in the previous section in order to sketch the graph of a polynomial we need to know what its zeroes are. However, if we are not able to factor the polynomial we are unable to do that process. So, in this section well look at a process using the Rational Root Theorem that will allow us to find some of the zeroes of a polynomial and in special cases all of the zeroes. Partial Fractions In this section we will take a look at the process of partial fractions and finding the partial fraction decomposition of a rational expression. What we will be asking here is what smaller rational expressions did we add and/or subtract to get the given rational expression. This is a process that has a lot of uses in some later math classes. It can show up in Calculus and Differential Equations for example. Exponential and Logarithm Functions - In this chapter we will introduce two very important functions in many areas : the exponential and logarithm functions. We will look at their basic properties, applications and solving equations involving the two functions. If you are in a field that takes you into the sciences or engineering then you will be running into both of these functions. Exponential Functions In this section we will introduce exponential functions. We will give some of the basic properties and graphs of exponential functions. We will also discuss what many people consider to be the exponential function, $f(x) = \{bf e^x\} (x \in \mathbb{R})$. Logarithm Functions In this section we will introduce logarithm functions. We give the basic properties and graphs of logarithm functions. In addition, we discuss how to evaluate some basic logarithms including the use of the change of base formula. We will also discuss the common logarithm, $f(x) = \log(x)$, and the natural logarithm, $f(x) = \ln(x)$. Solving Exponential Equations In this section we will discuss a couple of methods for solving equations that contain exponentials. Solving Logarithm Equations In this section we will discuss a couple of methods for solving equations that contain logarithms. Theorem as well as several useful facts. Graphing Parabolas In this section we will be graphing parabolas. We introduce the vertex and axis of symmetry for a parabola and give a process for graphing parabolas. We also illustrate how to use completing the square to put the parabola into the form $f(x) = a(x-h)^2 + k$. Ellipses In this section we will graph ellipses. We introduce the standard form of an ellipse and how to use it to quickly graph an ellipse. Hyperbolas In this section we will graph hyperbolas. We introduce the standard form of a hyperbola and how to use it to quickly graph a hyperbola. Miscellaneous Functions In this section we will graph a couple of common functions that dont really take all that much work to do but will be needed in later sections. Well be looking at the constant function, square root, absolute value and a simple cubic function. Transformations In this section we will be looking at vertical and horizontal shifts of graphs as well as reflections of graphs about the (x) and (y)-axis. Collectively these are often called transformations and if we understand them they can often be used to allow us to quickly graph some fairly complicated functions. Symmetry In this section we introduce the idea of symmetry. We discuss symmetry about the *x*-axis, *y*-axis and the origin and we give methods for determining what, if any symmetry, a graph will have without having to actually graph the function. Rational Functions In this section we will discuss a process for graphing rational functions. We will also introduce the ideas of vertical and horizontal asymptotes as well as how to determine if the graph of a rational function will have them. Polynomial Functions - In this chapter we will take a more detailed look at polynomial functions. We will discuss dividing polynomials, finding zeroes of polynomials and sketching the graph of polynomials. We will also look at partial fractions (even though this doesnt really involve polynomial functions). Dividing Polynomials In this section well review some of the basics of dividing polynomials. We will define the remainder and divisor used in the division process and introduce the idea of synthetic division. We will also give the Division Algorithm. Zeros/Roots of Polynomials In this section well define the zero or root of a polynomial and whether or not it is a simple root or has multiplicity (k). We will also give the Fundamental Theorem of Algebra and The Factor Theorem as well as a couple of other useful facts. Graphing Polynomials In this section we will give a process that will allow us to get a rough sketch of the graph of some polynomials. We discuss how to determine the behavior of the graph at (x)-intercepts and the leading coefficient test to determine the behavior of the graph as we allow *x* to increase and decrease without bound. Finding Zeros of Polynomials As we saw in the previous section in order to sketch the graph of a polynomial we need to know what its zeroes are. However, if we are not able to factor the polynomial we are unable to do that process. So, in this section well look at a process using the Rational Root Theorem that will allow us to find some of the zeroes of a polynomial and in special cases all of the zeroes. Partial Fractions In this section we will take a look at the process of partial fractions and finding the partial fraction decomposition of a rational expression. What we will be asking here is what smaller rational expressions did we add and/or subtract to get the given rational expression. This is a process that has a lot of uses in some later math classes. It can show up in Calculus and Differential Equations for example. Exponential and Logarithm Functions - In this chapter we will introduce two very important functions in many areas : the exponential and logarithm functions. We will look at their basic properties, applications and solving equations involving the two functions. If you are in a field that takes you into the sciences or engineering then you will be running into both of these functions. Exponential Functions In this section we will introduce exponential functions. We will give some of the basic properties and graphs of exponential functions. We will also discuss what many people consider to be the exponential function, $f(x) = \{bf e^x\} (x \in \mathbb{R})$. Logarithm Functions In this section we will introduce logarithm functions. We give the basic properties and graphs of logarithm functions. In addition, we discuss how to evaluate some basic logarithms including the use of the change of base formula. We will also discuss the common logarithm, $f(x) = \log(x)$, and the natural logarithm, $f(x) = \ln(x)$. Solving Exponential Equations In this section we will discuss a couple of methods for solving equations that contain exponentials. Solving Logarithm Equations In this section we will discuss a couple of methods for solving equations that contain logarithms. Theorem as well as several useful facts. Graphing Parabolas In this section we will be graphing parabolas. We introduce the vertex and axis of symmetry for a parabola and give a process for graphing parabolas. We also illustrate how to use completing the square to put the parabola into the form $f(x) = a(x-h)^2 + k$. Ellipses In this section we will graph ellipses. We introduce the standard form of an ellipse and how to use it to quickly graph an ellipse. Hyperbolas In this section we will graph hyperbolas. We introduce the standard form of a hyperbola and how to use it to quickly graph a hyperbola. Miscellaneous Functions In this section we will graph a couple of common functions that dont really take all that much work to do but will be needed in later sections. Well be looking at the constant function, square root, absolute value and a simple cubic function. Transformations In this section we will be looking at vertical and horizontal shifts of graphs as well as reflections of graphs about the (x) and (y)-axis. Collectively these are often called transformations and if we understand them they can often be used to allow us to quickly graph some fairly complicated functions. Symmetry In this section we introduce the idea of symmetry. We discuss symmetry about the *x*-axis, *y*-axis and the origin and we give methods for determining what, if any symmetry, a graph will have without having to actually graph the function. Rational Functions In this section we will discuss a process for graphing rational functions. We will also introduce the ideas of vertical and horizontal asymptotes as well as how to determine if the graph of a rational function will have them. Polynomial Functions - In this chapter we will take a more detailed look at polynomial functions. We will discuss dividing polynomials, finding zeroes of polynomials and sketching the graph of polynomials. We will also look at partial fractions (even though this doesnt really involve polynomial functions). Dividing Polynomials In this section well review some of the basics of dividing polynomials. We will define the remainder and divisor used in the division process and introduce the idea of synthetic division. We will also give the Division Algorithm. Zeros/Roots of Polynomials In this section well define the zero or root of a polynomial and whether or not it is a simple root or has multiplicity (k). We will also give the Fundamental Theorem of Algebra and The Factor Theorem as well as a couple of other useful facts. Graphing Polynomials In this section we will give a process that will allow us to get a rough sketch of the graph of some polynomials. We discuss how to determine the behavior of the graph at (x)-intercepts and the leading coefficient test to determine the behavior of the graph as we allow *x* to increase and decrease without bound. Finding Zeros of Polynomials As we saw in the previous section in order to sketch the graph of a polynomial we need to know what its zeroes are. However, if we are not able to factor the polynomial we are unable to do that process. So, in this section well look at a process using the Rational Root Theorem that will allow us to find some of the zeroes of a polynomial and in special cases all of the zeroes. Partial Fractions In this section we will take a look at the process of partial fractions and finding the partial fraction decomposition of a rational expression. What we will be asking here is what smaller rational expressions did we add and/or subtract to get the given rational expression. This is a process that has a lot of uses in some later math classes. It can show up in Calculus and Differential Equations for example. Exponential and Logarithm Functions - In this chapter we will introduce two very important functions in many areas : the exponential and logarithm functions. We will look at their basic properties, applications and solving equations involving the two functions. If you are in a field that takes you into the sciences or engineering then you will be running into both of these functions. Exponential Functions In this section we will introduce exponential functions. We will give some of the basic properties and graphs of exponential functions. We will also discuss what many people consider to be the exponential function, $f(x) = \{bf e^x\} (x \in \mathbb{R})$. Logarithm Functions In this section we will introduce logarithm functions. We give the basic properties and graphs of logarithm functions. In addition, we discuss how to evaluate some basic logarithms including the use of the change of base formula. We will also discuss the common logarithm, $f(x) = \log(x)$, and the natural logarithm, $f(x) = \ln(x)$. Solving Exponential Equations In this section we will discuss a couple of methods for solving equations that contain exponentials. Solving Logarithm Equations In this section we will discuss a couple of methods for solving equations that contain logarithms. Theorem as well as several useful facts. Graphing Parabolas In this section we will be graphing parabolas. We introduce the vertex and axis of symmetry for a parabola and give a process for graphing parabolas. We also illustrate how to use completing the square to put the parabola into the form $f(x) = a(x-h)^2 + k$. Ellipses In this section we will graph ellipses. We introduce the standard form of an ellipse and how to use it to quickly graph an ellipse. Hyperbolas In this section we will graph hyperbolas. We introduce the standard form of a hyperbola and how to use it to quickly graph a hyperbola. Miscellaneous Functions In this section we will graph a couple of common functions that dont really take all that much work to do but will be needed in later sections. Well be looking at the constant function, square root, absolute value and a simple cubic function. Transformations In this section we will be looking at vertical and horizontal shifts of graphs as well as reflections of graphs about the (x) and (y)-axis. Collectively these are often called transformations and if we understand them they can often be used to allow us to quickly graph some fairly complicated functions. Symmetry In this section we introduce the idea of symmetry. We discuss symmetry about the *x*-axis, *y*-axis and the origin and we give methods for determining what, if any symmetry, a graph will have without having to actually graph the function. Rational Functions In this section we will discuss a process for graphing rational functions. We will also introduce the ideas of vertical and horizontal asymptotes as well as how to determine if the graph of a rational function will have them. Polynomial Functions - In this chapter we will take a more detailed look at polynomial functions. We will discuss dividing polynomials, finding zeroes of polynomials and sketching the graph of polynomials. We will also look at partial fractions (even though this doesnt really involve polynomial functions). Dividing Polynomials In this section well review some of the basics of dividing polynomials. We will define the remainder and divisor used in the division process and introduce the idea of synthetic division. We will also give the Division Algorithm. Zeros/Roots of Polynomials In this section well define the zero or root of a polynomial and whether or not it is a simple root or has multiplicity (k). We will also give the Fundamental Theorem of Algebra and The Factor Theorem as well as a couple of other useful facts. Graphing Polynomials In this section we will give a process that will allow us to get a rough sketch of the graph of some polynomials. We discuss how to determine the behavior of the graph at (x)-intercepts and the leading coefficient test to determine the behavior of the graph as we allow *x* to increase and decrease without bound. Finding Zeros of Polynomials As we saw in the previous section in order to sketch the graph of a polynomial we need to know what its zeroes are. However, if we are not able to factor the polynomial we are unable to do that process. So, in this section well look at a process using the Rational Root Theorem that will allow us to find some of the zeroes of a polynomial and in special cases all of the zeroes. Partial Fractions In this section we will take a look at the process of partial fractions and finding the partial fraction decomposition of a rational expression. What we will be asking here is what smaller rational expressions did we add and/or subtract to get the given rational expression. This is a process that has a lot of uses in some later math classes. It can show up in Calculus and Differential Equations for example. Exponential and Logarithm Functions - In this chapter we will introduce two very important functions in many areas : the exponential and logarithm functions. We will look at their basic properties, applications and solving equations involving the two functions. If you are in a field that takes you into the sciences or engineering then you will be running into both of these functions. Exponential Functions In this section we will introduce exponential functions. We will give some of the basic properties and graphs of exponential functions. We will also discuss what many people consider to be the exponential function, $f(x) = \{bf e^x\} (x \in \mathbb{R})$. Logarithm Functions In this section we will introduce logarithm functions. We give the basic properties and graphs of logarithm functions. In addition, we discuss how to evaluate some basic logarithms including the use of the change of base formula. We will also discuss the common logarithm, $f(x) = \log(x)$, and the natural logarithm, $f(x) = \ln(x)$. Solving Exponential Equations In this section we will discuss a couple of methods for solving equations that contain exponentials. Solving Logarithm Equations In this section we will discuss a couple of methods for solving equations that contain logarithms. Theorem as well as several useful facts. Graphing Parabolas In this section we will be graphing parabolas. We introduce the vertex and axis of symmetry for a parabola and give a process for graphing parabolas. We also illustrate how to use completing the square to put the parabola into the form $f(x) = a(x-h)^2 + k$. Ellipses In this section we will graph ellipses. We introduce the standard form of an ellipse and how to use it to quickly graph an ellipse. Hyperbolas In this section we will graph hyperbolas. We introduce the standard form of a hyperbola and how to use it to quickly graph a hyperbola. Miscellaneous Functions In this section we will graph a couple of common functions that dont really take all that much work to do but will be needed in later sections. Well be looking at the constant function, square root, absolute value and a simple cubic function. Transformations In this section we will be looking at vertical and horizontal shifts of graphs as well as reflections of graphs about the (x) and (y)-axis. Collectively these are often called transformations and if we understand them they can often be used to allow us to quickly graph some fairly complicated functions. Symmetry In this section we introduce the idea of symmetry. We discuss symmetry about the *x*-axis, *y*-axis and the origin and we give methods for determining what, if any symmetry, a graph will have without having to actually graph the function. Rational Functions In this section we will discuss a process for graphing rational functions. We will also introduce the ideas of vertical and horizontal asymptotes as well as how to determine if the graph of a rational function will have them. Polynomial Functions - In this chapter we will take a more detailed look at polynomial functions. We will discuss dividing polynomials, finding zeroes of polynomials and sketching the graph of polynomials. We will also look at partial fractions (even though this doesnt really involve polynomial functions). Dividing Polynomials In this section well review some of the basics of dividing polynomials. We will define the remainder and divisor used in the division process and introduce the idea of synthetic division. We will also give the Division Algorithm. Zeros/Roots of Polynomials In this section well define the zero or root of a polynomial and whether or not it is a simple root or has multiplicity (k). We will also give the Fundamental Theorem of Algebra and The Factor Theorem as well as a couple of other useful facts. Graphing Polynomials In this section we will give a process that will allow us to get a rough sketch of the graph of some polynomials. We discuss how to determine the behavior of the graph at (x)-intercepts and the leading coefficient test to determine the behavior of the graph as we allow *x* to increase and decrease without bound. Finding Zeros of Polynomials As we saw in the previous section in order to sketch the graph of a polynomial we need to know what its zeroes are. However, if we are not able to factor the polynomial we are unable to do that process. So, in this section well look at a process using the Rational Root Theorem that will allow us to find some of the zeroes of a polynomial and in special cases all of the zeroes. Partial Fractions In this section we will take a look at the process of partial fractions and finding the partial fraction decomposition of a rational expression. What we will be asking here is what smaller rational expressions did we add and/or subtract to get the given rational expression. This is a process that has a lot of uses in some later math classes. It can show up in Calculus and Differential Equations for example. Exponential and Logarithm Functions - In this chapter we will introduce two very important functions in many areas : the exponential and logarithm functions. We will look at their basic properties, applications and solving equations involving the two functions. If you are in a field that takes you into the sciences or engineering then you will be running into both of these functions. Exponential Functions In this section we will introduce exponential functions. We will give some of the basic properties and graphs of exponential functions. We will also discuss what many people consider to be the exponential function, $f(x) = \{bf e^x\} (x \in \mathbb{R})$. Logarithm Functions In this section we will introduce logarithm functions. We give the basic properties and graphs of logarithm functions. In addition, we discuss how to evaluate some basic logarithms including the use of the change of base formula. We will also discuss the common logarithm, $f(x) = \log(x)$, and the natural logarithm, $f(x) = \ln(x)$. Solving Exponential Equations In this section we will discuss a couple of methods for solving equations that contain exponentials. Solving Logarithm Equations In this section we will discuss a couple of methods for solving equations that contain logarithms. Theorem as well as several useful facts. Graphing Parabolas In this section we will be graphing parabolas. We introduce the vertex and axis of symmetry for a parabola and give a process for graphing parabolas. We also illustrate how to use completing the square to put the parabola into the form $f(x) = a(x-h)^2 + k$. Ellipses In this section we will graph ellipses. We introduce the standard form of an ellipse and how to use it to quickly graph an ellipse. Hyperbolas In this section we will graph hyperbolas. We introduce the standard form of a hyperbola and how to use it to quickly graph a hyperbola. Miscellaneous Functions In this section we will graph a couple of common functions that dont really take all that much work to do but will be needed in later sections. Well be looking at the constant function, square root, absolute value and a simple cubic function. Transformations In this section we will be looking at vertical and horizontal shifts of graphs as well as reflections of graphs about the (x) and (y)-axis. Collectively these are often called transformations and if we understand them they can often be used to allow us to quickly graph some fairly complicated functions. Symmetry In this section we introduce the idea of symmetry. We discuss symmetry about the *x*-axis, *y*-axis and the origin and we give methods for determining what, if any symmetry, a graph will have without having to actually graph the function. Rational Functions In this section we will discuss a process for graphing rational functions. We will also introduce the ideas of vertical and horizontal asymptotes as well as how to determine if the graph of a rational function will have them. Polynomial Functions - In this chapter we will take a more detailed look at polynomial functions. We will discuss dividing polynomials, finding zeroes of polynomials and sketching the graph of polynomials. We will also look at partial fractions (even though this doesnt really involve polynomial functions). Dividing Polynomials In this section well review some of the basics of dividing polynomials. We will define the remainder and divisor used in the division process and introduce the idea of synthetic division. We will also give the Division Algorithm. Zeros/Roots of Polynomials In this section well define the zero or root of a polynomial and whether or not it is a simple root or has multiplicity (k). We will also give the Fundamental Theorem of Algebra and The Factor Theorem as well as a couple of other useful facts. Graphing Polynomials In this section we will give a process that will allow us to get a rough sketch of the graph of some polynomials. We discuss how to determine the behavior of the graph at (x)-intercepts and the leading coefficient test to determine the behavior of the graph as we allow *x* to increase and decrease without bound. Finding Zeros of Polynomials As we saw in the previous section in order to sketch the graph of a polynomial we need to know what its zeroes are. However, if we are not able to factor the polynomial we are unable to do that process. So, in this section well look at a process using the Rational Root Theorem that will allow us to find some of the zeroes of a polynomial and in special cases all of the zeroes. Partial Fractions In this section we will take a look at the process of partial fractions and finding the partial fraction decomposition of a rational expression. What we will be asking here is what smaller rational expressions did we add and/or subtract to get the given rational expression. This is a process that has a lot of uses in some later math classes. It can show up in Calculus and Differential Equations for example. Exponential and Logarithm Functions - In this chapter we will introduce two very important functions in many areas : the exponential and logarithm functions. We will look at their basic properties, applications and solving equations involving the two functions. If you are in a field that takes you into the sciences or engineering then you will be running into both of these functions. Exponential Functions In this section we will introduce exponential functions. We will give some of the basic properties and graphs of exponential functions. We will also discuss what many people consider to be the exponential function, $f(x) = \{bf e^x\} (x \in \mathbb{R})$. Logarithm Functions In this section we will introduce logarithm functions. We give the basic properties and graphs of logarithm functions. In addition, we discuss how to evaluate some basic logarithms including the use of the change of base formula. We will also discuss the common logarithm, $f(x) = \log(x)$, and the natural logarithm, $f(x) = \ln(x)$. Solving Exponential Equations In this section we will discuss a couple of methods for solving equations that contain exponentials. Solving Logarithm Equations In this section we will discuss a couple of methods for solving