Graphing

Math 116 - College Algebra

Recreate the following documents. Use Word or WordPerfect to type the document and Winplot to create the graphs. Copy and paste the graphs from Winplot into Word and then email the document to the instructor at james@richland.edu.

Each document is worth 10 points and is due by the beginning of class on the day after the corresponding chapter is over. Due dates are listed on the calendar as a reminder. Late work will be accepted but will lose 20% of its value per class period.

If you fail to type your name on the page, you will lose 1 point. Do not type the hints or the reminders that appear.

You should strive to make your graphs look as close to mine as possible. Positioning on the page does not have to be identical and your documents may grow to be more than one page.

Do NOT copy the graphs off the website and paste them into your document. Part of the experience I want you to have is creating the graphs. Make sure you do your own work.

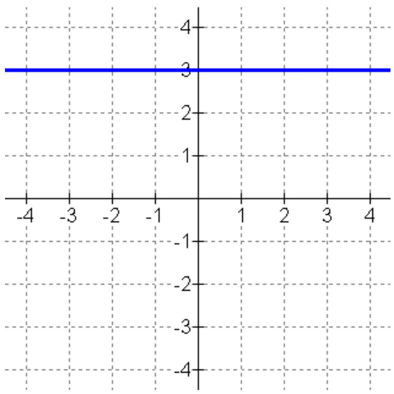
Here are some hints to make your plots look like mine. In most cases, these are the values I am using. You will need to look at the graph to see if there is a difference.

- The image size (File / Image size) is 5.1×5.1.
- The grid (View / Grid) is set to an interval of 1, the scale is displayed with 0 decimal places and a frequency of 1. The grid is dotted and enabled for rectangular graphs.
- The font (Misc / Fonts / Scale on axes) for the axes is set to 12 pt Arial.
- The background color (Misc / Colors / Background) is white.
- The view (View / View) is set at the center of (0,0) with a width of 9.
- When making plots, the pen width is 3 and the plots are in blue.
- When plotting points, the size of most points is 7. Open circles have size 10.
- The font for annotation text is red 14 pt bold Arial. Some text is rotated 45 degrees or -45 degrees to make it fit better.
- My images are 2"×2" in the document, but you can scale them as needed.

Remember to put your name at the top of the page

Chapter 1 - Basic Graphs

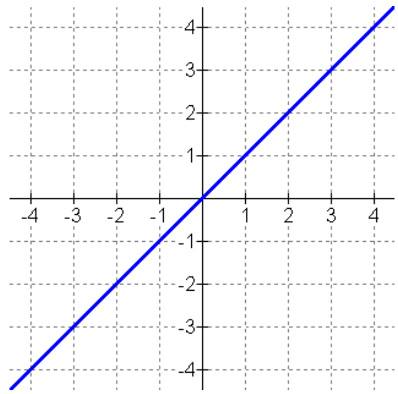
Here are the basic graphs. Know them. Use them as building blocks for translated graphs.



Constant $y = c$

Domain: $(-\infty, +\infty)$

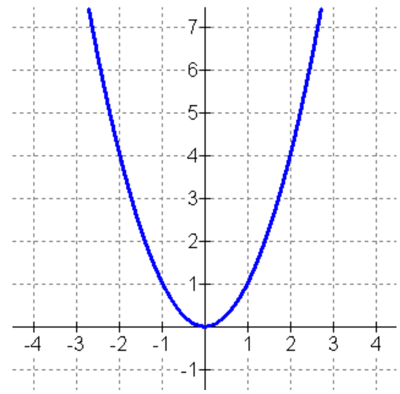
Range: $\{c\}$



Linear $y = x$

Domain: $(-\infty, +\infty)$

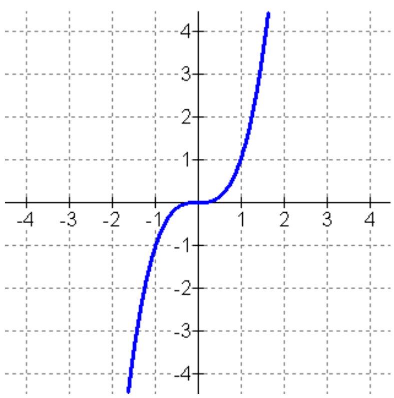
Range: $(-\infty, +\infty)$



Quadratic $y = x^2$

Domain: $(-\infty, +\infty)$

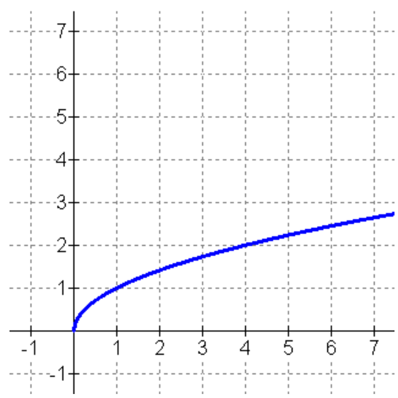
Range: $[0, +\infty)$



Cubic $y = x^3$

Domain: $(-\infty, +\infty)$

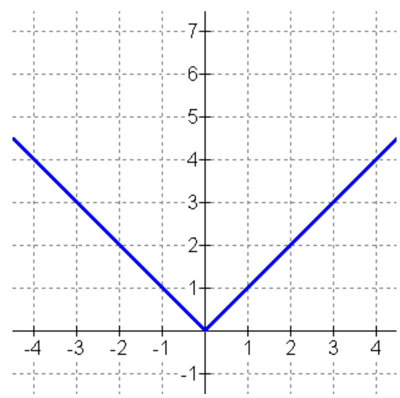
Range: $(-\infty, +\infty)$



Square Root $y = \sqrt{x}$

Domain: $[0, +\infty)$

Range: $[0, +\infty)$



Absolute Value $y = |x|$

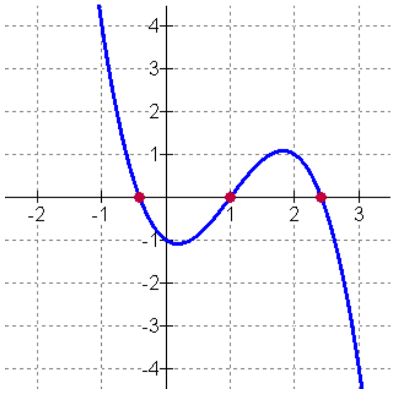
Domain: $(-\infty, +\infty)$

Range: $[0, +\infty)$

Remember to put your name at the top of the page

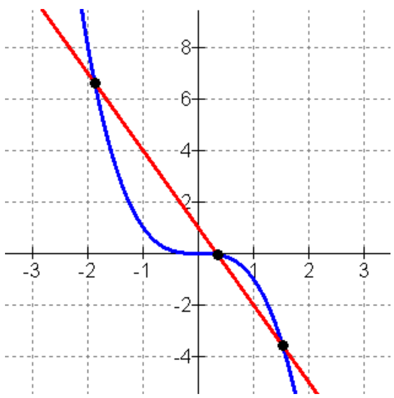
Chapter 2 - Solving Equations Graphically

Approximate the zeros of $y = -x^3 + 3x^2 - x - 1$



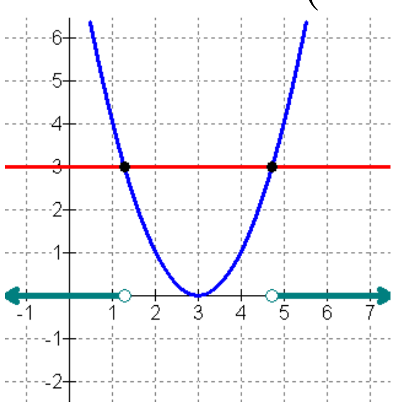
The zeros are { -0.41421, 1, 2.41421 }

Determine any points of intersection of $3x + y = 1$ and $x^3 + y = 0$.



The points of intersection are { (-1.879, 6.638), (0.347, -0.042), (1.532, - 3.596) }

Determine the solution to $(x-3)^2 > 3$

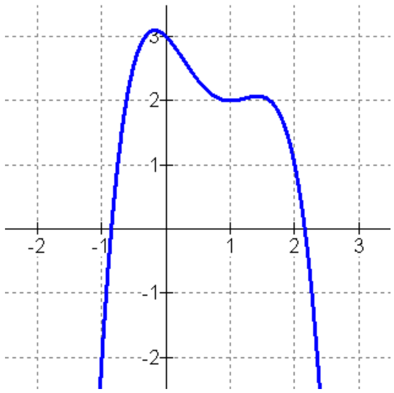


The solution is $(-\infty, 1.268) \cup (4.732, +\infty)$

Remember to put your name at the top of the page

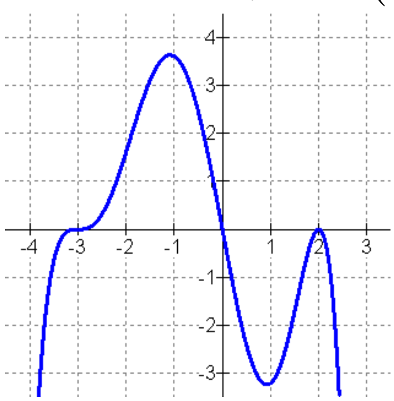
Chapter 3 - Polynomial Functions

Consider the graph of $y = -x^4 + 3x^3 - 2x^2 - x + 3$



The graph goes down to the right because the leading coefficient is negative and does the same thing on the left side since the degree is even. The maximum number of real roots is 4, which is the degree but this may decrease by twos and there are two real roots in this case. The maximum number of turns is 3, which is one less than the degree, and that's how many turns there are.

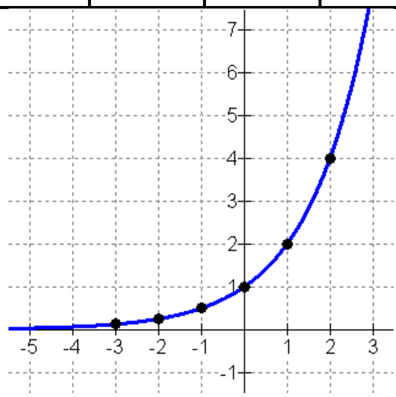
Consider the graph of $y = -x\left(x-2\right)^2\left(x+3\right)^3/20$



The graph goes down on the right side because the leading coefficient is negative. The graph crosses the x-axis at $x = 0$ and $x = -3$ because the multiplicity on those factors is odd and touches the x-axis at $x = 2$ because the multiplicity on that factor is even. There is a horizontal tangent wherever the factor has a multiplicity greater than 1.

Here is a table and graph for the exponential function $y = 2^x$

x	-3	-2	-1	0	1	2	3
y	1 / 8	1 / 4	1 / 2	1	2	4	8



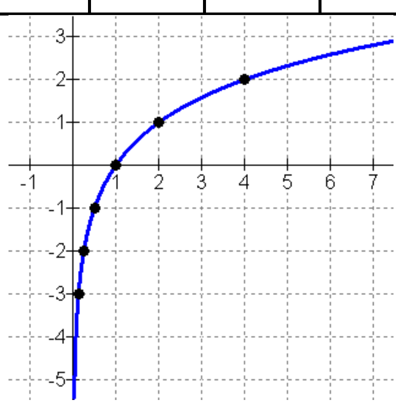
Domain: $(-\infty, +\infty)$

Range: $(0, +\infty)$

Here is a table and graph for the logarithmic function $y = \log_2 x$.

Notice the x and y values are switched from the exponential function $y = 2^x$.

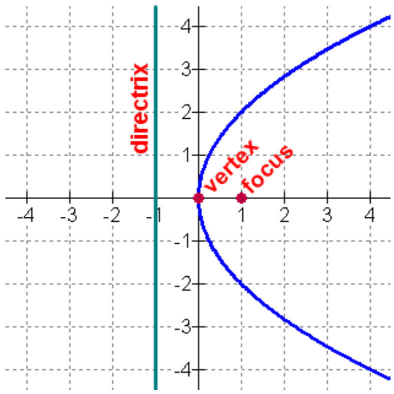
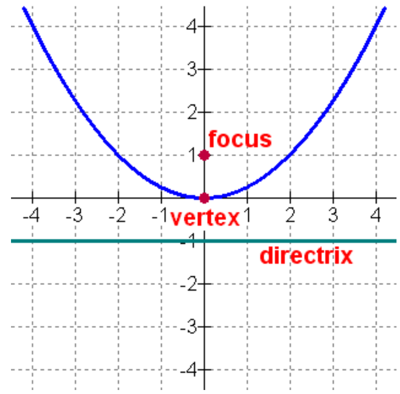
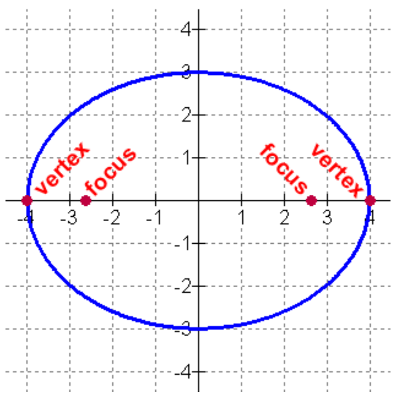
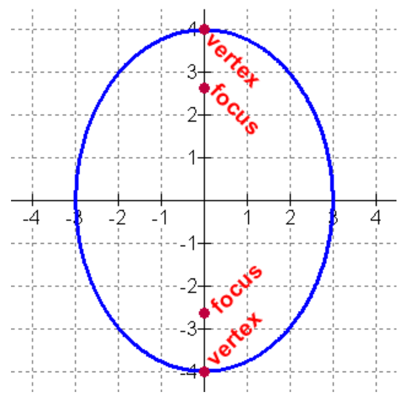
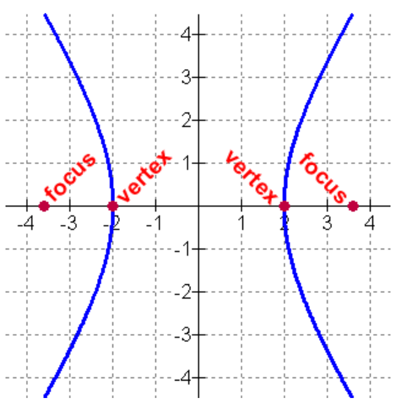
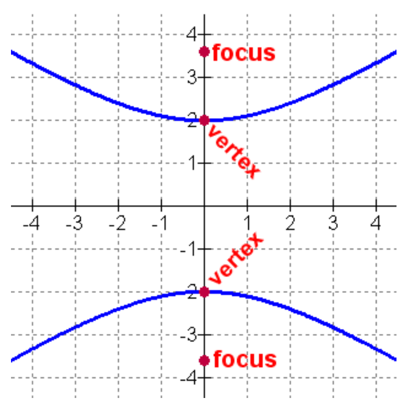
x	1 / 8	1 / 4	1 / 2	1	2	4	8
y	-3	-2	-1	0	1	2	3



Domain: $(0, +\infty)$

Range: $(-\infty, +\infty)$

Chapter 7 - Conic Sections

Conic	Horizontal	Vertical
Parabola	 $y^2 = 4x$	 $x^2 = 4y$
Ellipse	 $\frac{x^2}{16} + \frac{y^2}{9} = 1$	 $\frac{x^2}{9} + \frac{y^2}{16} = 1$
Hyperbola	 $\frac{x^2}{4} - \frac{y^2}{9} = 1$	 $\frac{y^2}{4} - \frac{x^2}{9} = 1$

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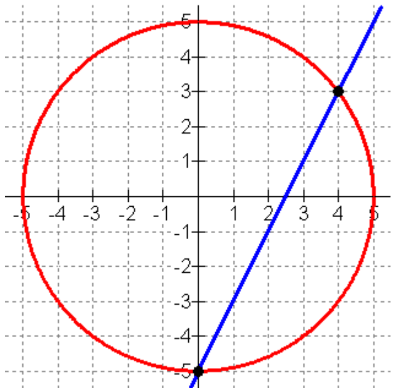
Chapter 5 - Solving Systems of Equations

Solve the system of equations by finding the intersection points.

$$y = 2x - 5$$

$$x^2 + y^2 = 25$$



The solution is the set of points { (0, -5), (4, 3) }

The equation of the parabola best fitting the points

{ (0, 0), (1, 1), (2, 2), (3, 5), (4, 9), (5, 11) }

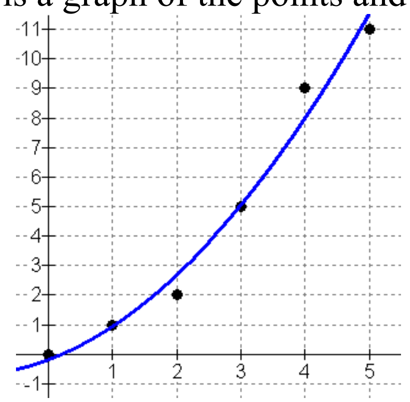
can be found by solving this system of equations.

$$\begin{array}{rcrcrcr} 979x^2 & + & 225x & + & 55 & = & 473 \\ 225x^2 & + & 55x & + & 15 & = & 111 \\ 55x^2 & + & 15x & + & 6 & = & 28 \end{array}$$

Hint: A 3×7 right-aligned matrix was used to create this system of equations. The matrix row spacing was set to 100% and the matrix column spacing was set to 50%.

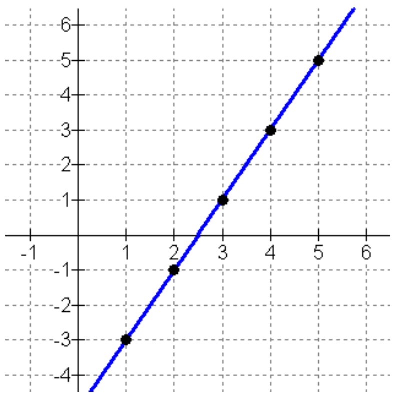
The solution is $y = 0.303571x^2 + 0.825x - 0.17857$.

Here is a graph of the points and the best fitting parabola.



Chapter 6 - Sequences and Series

An arithmetic sequence has a first term of $a_1 = -3$ and a common difference of $d = 2$.
The terms in the sequence are { -3, -1, 1, 3, 5, ... }.
The general term of an arithmetic sequence is $a_n = a_1 + (n-1)d$, so we get $a_n = -3 + (n-1)(2)$ or $a_n = 2n - 5$. If you plot the points and connect them, you have the graph of the line $y = 2x - 5$.



A geometric sequence has a first term of $a_1 = 1.5$ and a common ratio of $r = 1.3$.
The terms in the sequence are { 1.5, 1.95, 2.535, 3.2955, 4.28415, 5.569395, ... }.
The general term of a geometric sequence is $a_n = a_1 r^{n-1}$, so we get $a_n = 1.5(1.3)^{n-1}$.
If you plot the points and connect them, you have the graph of the exponential function $y = 1.5(1.3)^{x-1}$.