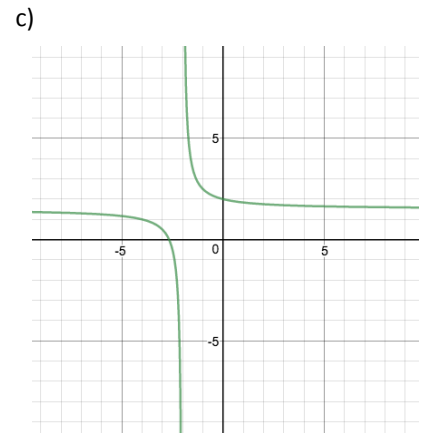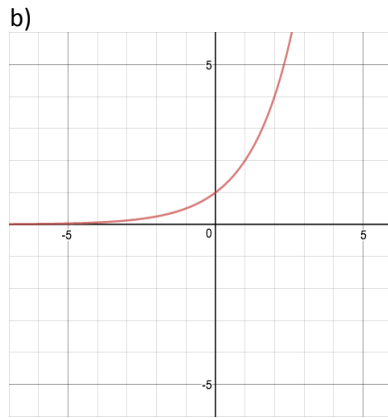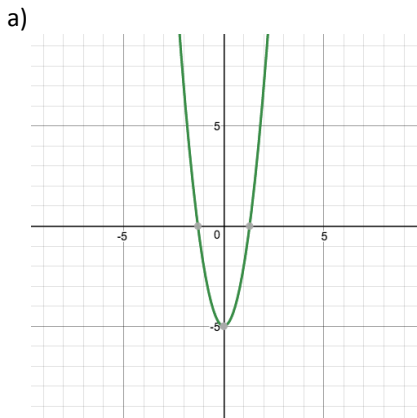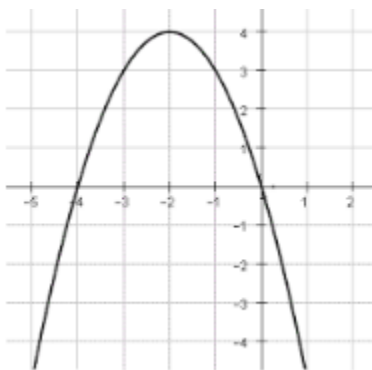1) Identify the function family to which each graph belongs: Solutions are in | text boxes below. |

a)

b)

c)

| Quadratic because it is symmetric and shaped like a "U". It has been vertically stretched and shifted down. | Exponential (growth) because it never crosses the x-axis and it increases at an increasing rate. | Rational because it has vertical and horizontal asymptotes. This one has been shifted left and up. |

2) Use the two functions, f(x) and g(x), below to answer the following questions:

$g(x) = -3x^2 + 6x + 3$

a) Which function has the greater maximum value?

g(x) because it faces down with a vertex at (1,6). So the maximum value is 6. f(x) has a maximum value at 4.
To find the vertex, complete the square like this:
$$g(x) = -3x^2 + 6x + 3$$
$$g(x) = -3(x^2 - 2x + ?) + 3 - ?$$
$$g(x) = -3(x^2 - 2x + 1) + 3 - (-3)(1)$$
$$g(x) = -3(x - 1)^2 + 3 + 3$$
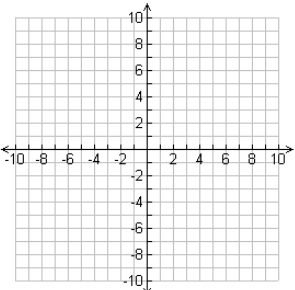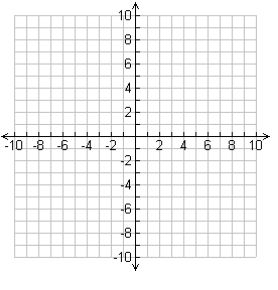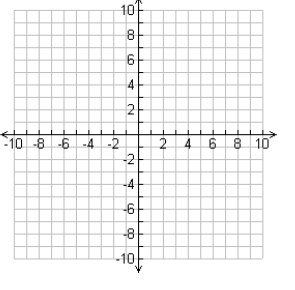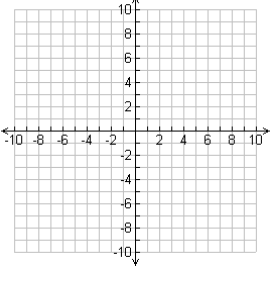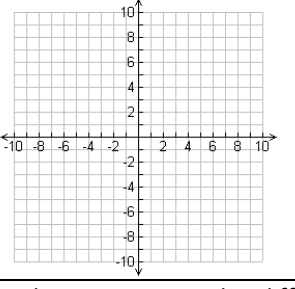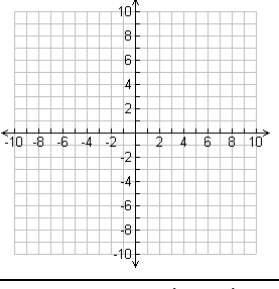$$g(x) = -3(x - 1)^2 + 6$$

b) Which function has the smaller y-intercept?

f(x) because f(0) = 0 while $g(0) = -3(0)^2 + 6(0) + 3 = 3$

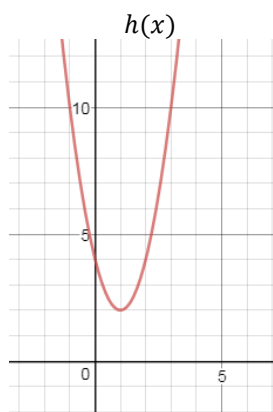Additional Practice:

Show all of your work and explain your solutions.

Using your graphing calculator you will explore the parent functions of the different families. For each of the following make sure your graphing window is set to [-10, 10, 1, -10, 10, 1]. Type the equation into y= then use the graph and the table capabilities of your calculator to make a sketch of the function on the grid provided.

Quadratic $f(x) = x^2$		Exponential growth $g(x) = 2^x$	
Cubic $f(x) = x^3$		Exponential decay $g(x) = \left(\dfrac{1}{2}\right)^x$	
Inverse or Rational $f(x) = \dfrac{1}{x}$		Square root or Radical $g(x) = \sqrt{x}$	

When comparing functions that are presented in different formats you need to find common parts to compare such as the y-intercepts or the minimum/maximum values.

Compare the following functions without using your graphing calculator:

$h(x)$

$j(x)$

x	y
−3	6
−2	0
−1	−4
0	−6
1	−6
2	−4
3	0
4	6

$k(x)$

$$k(x) = 2x^2 + 12x + 8$$

a) Which function has the smallest y-intercept? Do not use your graphing calculator. Show your work.

b) Which function has the highest minimum value? Without using your graphing calculator, find the vertex of each quadratic. Show your work.