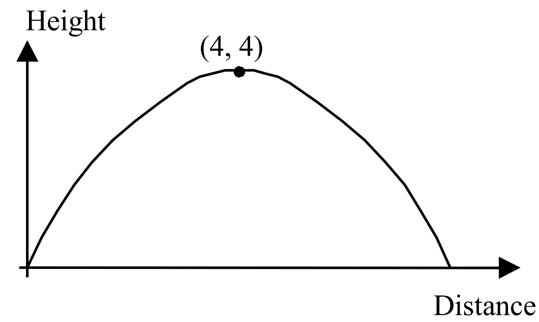
Quadratic Functions Review 1

1. The parabolic trajectory (path) of a ball thrown from Pat to Chris is illustrated in the Cartesian diagram below. The maximum height reached by the ball is 4 m.
Which of the following rules of correctly defines this parabola?



A) $y = x^2 - 8x$ C) $y = -0.25\,x^2 - 2x$

B) $y = -\,4x^2 + 2x$ D) $y = -0.25\,x^2 + 2x$

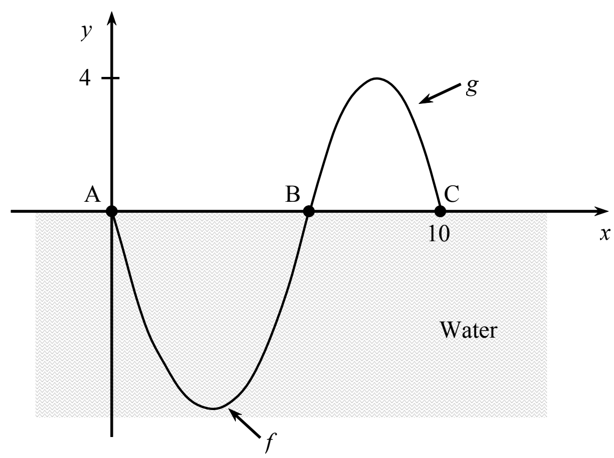
2. What is the equation (rule) of the second-degree function that has a range of $(-\infty, 4]$ and is positive for $x \in \,]-1, 3[$?

3. What are the zeros of the function $f(x) = x^2 - 2x + 1$?

4. In a Cartesian plane, function f is represented by a parabola. Point P(–7, 172) is one of the points on this parabola, and point V(3, –8) is its vertex. What is the rule of function f?

5. In a Cartesian plane, function f is represented by a parabola. The zeros of function f are 10 and 20, and its minimum is –75. What is the rule of function f?

6. The following graph represents the side view of the path of a dolphin as it performs a trick during a show at an aquarium. This path is composed of portions of two parabolas associated with function f and g respectively. The scale of the graph is in metres. The rule $f(x) = \frac{5}{9}(x-3)^2 - 5$ represents the dolphin's path when it is in the water. When it is out of the water, the dolphin reaches a maximum height of 4 metres. The distance between points A and C is 10 metres. What is the rule of the function g?



7. Determine the equation of the second-degree function associated with the description provided.

a) The vertex is located at $V(3,\ 2)$ and the graph passes through the point $P(4,\ 3)$.

b) The two zeros are -3 and 1 and $f(-1) = 2$.

c) The equation of the axis of symmetry is $x = -1$. The maximum is 2 and the graph passes through the point $P(4,\ -123)$.

d) The only zero of the function is -2 and $f(-1) = -1$.

e) Points $P(-1,\ 7)$, $Q(-9,\ 7)$ and $R(-3,\ 1)$ are on the parabola representing the function.

f) The y-intercept is greater than or equal to the zeros, which are -1 and 5.

QUADRATIC FUNCTIONS (Extra Practice):

1. Determine the domain and range of the following functions.

a) $f(x) = -3(x-2)^2 + 5$

b) $f(x) = 2x^2 + 4x - 9$

2. Determine the zeros of the function $f(x) = -3(x+1)^2 + 12$.

3. Determine the y-intercept of $f(x) = -\frac{1}{2}(x+4)^2 + 9$.

4. Determine over what interval the function $f(x) = 2x^2 - 5x - 3$ is positive.

5. Determine over what interval the function $f(x) = 3x^2 + 6x - 5$ is increasing.

6. Determine the extrema of the function $f(x) = -2x^2 + 12x - 7$.

7. What is the axis of symmetry of the function $f(x) = -\frac{1}{4}x^2 + 3x + 1$?

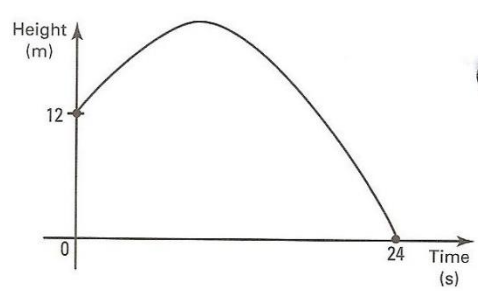
8. Determine the values of x for which the function $f(x) = -3(x+4)^2 + 5$ is equal to -7.

9. Find the rule of the quadratic function represented by a parabola with a vertex at V(−1, 5) and passing through the point P(1, 3).

10. A stone is thrown upward from the top of a seaside cliff. The function which gives the stone's height h (in m) above sea level as a function of time t (in sec) since it was thrown has the rule: $h = -t^2 + 12t + 160$.
Find the interval of time over which the height of the stone is at least 180 m above sea level.

11. The height h, in metres, of a diver relative to the water level is described by the rule $h = \frac{1}{2}t^2 - 6t + 10$ where t represents the elapsed time, in seconds, since the start of the dive. How long did the diver remain underwater?

~~12.~~ A projectile is thrown upward from a height of 12 m. After 10 seconds, it reaches its maximum height and after 24 seconds, it hits the ground. Knowing that its trajectory follows the rule of a quadratic function, find the elapsed time between the moment it reaches a height of 6.5 m, on its descent, and the time when it hits the ground.



Quadratic Functions Review 4

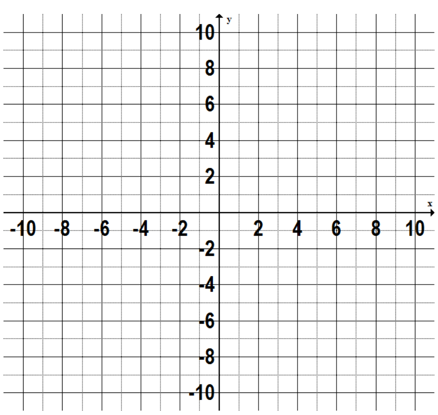
1. Determine the ***y-intercept*** for the following equation: $y = -3(x-4)^2 + 100$

2. Clearly explain in words ***ALL*** of the transformations that must be applied to ***y = x²*** to obtain the graph of the function below (point form is fine…). Consider shape of the curve and position on the Cartesian plane.

$$y = -\frac{1}{4}(x+6)^2 + 12$$

3. Sketch each quadratic and fill in the blanks below. An appropriate sketch would have 4 defined points.

$y = (x-2)^2 + 3$



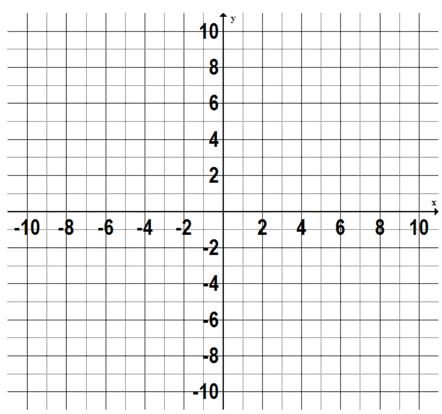
Vertex: _____________

Axis of Symmetry: _____________

x-Intercepts: _____________

y-Intercept: _____________

$y = -(x+5)^2 - 2$



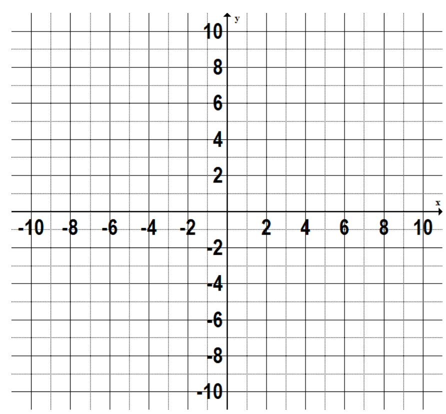
Vertex: _____________

Axis of Symmetry: _____________

Max / Min: _____________

Range: _____________

$y = 0.5(x-4)^2 + 5$



Vertex: _____________

Axis of Symmetry: _____________

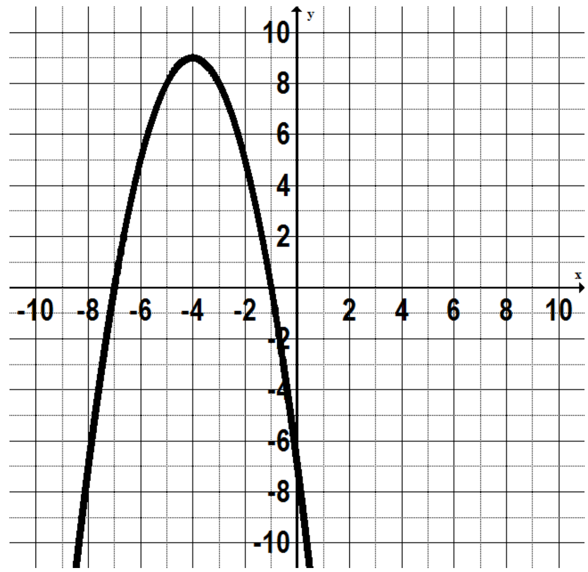
~~Step Pattern (1st 3 steps):~~ __________

Domain: _____________

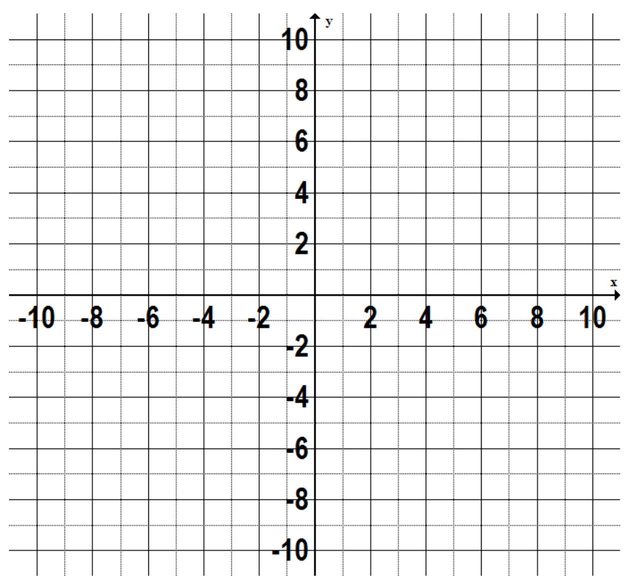
4. For each quadratic equation below, solve for x (either by ZPP or QF) . Then, imagine each quadratic equation is a function, and determine the vertex of the graph of the function by completing the square.

a. $x^2 - 11x + 24 = 0$ Zeros: Vertex:	b. $-\frac{1}{2}x^2 - 4x = -10$ Zeros: Vertex:
c. $x^2 + 6x - 27 = 0$ Zeros: Vertex:	d. $x^2 - 6x + 9 = 0$ Zeros: Vertex:
e. $x^2 - 11x = 0$ Zeros: Vertex:	f. $x^2 + 12x + 36 = 0$ Zeros: Vertex:
g. $-5x^2 - 40x = 0$ Zeros: Vertex:	h. $2x^2 + 2x = 24$ Zeros: Vertex:

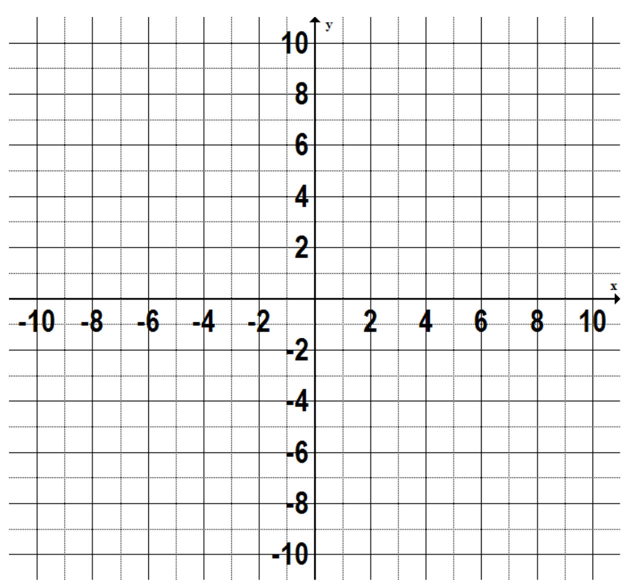
5. Complete the table below for each relation:



General Form Equation:	
Standard Form Equation:	
~~Factored Form Equation:~~	
Vertex:	(-4, 9)
Zeros:	
y-Intercept:	(0, -6)
Range:	
Equation of axis of symmetry:	



General Form Equation:	$y = 3x^2 + 48x + 192$
Standard Form Equation:	
~~Factored Form Equat~~ion:	
Vertex:	
Zeros:	
y-Intercept:	
Range:	
Equation of axis of symmetry:	



Standard Form Equation:	
Vertex Form Equation:	$y = -0.2(x-4)^2 + 5$
~~Factored Form Equation:~~	
Vertex:	
Zeros:	
y-Intercept:	
Range:	
Equation of axis of symmetry:	

6. Sideshow Bob fires a cannon hurtling Krusty the Clown through the air.
Krusty's path can be modelled by the equation $\boldsymbol{h} = -\mathbf{8}\boldsymbol{t}^{2} + \mathbf{40}\boldsymbol{t}$, where ***t*** is the time in seconds and ***h*** is the height of Krusty above the ground in metres.

a) **Create a rough sketch** of Krusty's parabolic flight.
(label the vertex, the y-intercept, and show how you obtained them)

b) What is the **maximum height** reached by Krusty? ________ m

c) After how long does Krusty reach his maximum height? ________ s

d) How many seconds will it take for Krusty to **land back on the ground**? ________ s

7. In 1993, Joe Carter hit a homerun over the left field wall at the SkyDome in the bottom of the 9th to give the Blue Jays, and Canada, an unprecedented two World Series Championships in a row! It was amazing!
The function $\boldsymbol{h = -0.001d^2 + 0.4d + 3}$ models the height, *h* feet, of Joe's ball as a function of the distance travelled, *d* feet, from home plate.

a) How high above the ground did Joe make contact with the ball? __________ ft.

b) What was the height of the ball as it sailed over the wall 325 feet from home plate? __________ ft.

c) How far from home plate was the ball when it began to fall back to the ground? __________ ft.

d) What was the height of the ball when it began to fall back to the ground? __________ ft.

e) How far from home plate would the ball have hit the ground? __________ ft.
(Assume the ball lands on the ground)

f) Approximately how many feet did the ball travel at a height of at least 30 feet? __________ ft.

g) Draw and label a rough sketch of the situation.
Include: zeros, vertex, y-intercept, axis of symmetry, points at which ball was 30 feet above the ground, home plate, the outfield wall, height of the ball as it sailed over the wall.