Quadratic Functions

1. Given the quadratic function $f(x) = ax^2 + bx + c$, the expression $b^2 - 4ac$ is called the discriminant of $f(x)$. How many solutions (a.k.a. roots, *x-intercepts*, or zeros) will $f(x)$ have under the following conditions?

(a) $b^2 - 4ac < 0$

(b) $b^2 - 4ac > 0$

(c) $b^2 - 4ac = 0$

2. Given the graph of $f(x) = ax^2 + bx + c$, determine the sign of the coefficient a of x^2 under the following conditions and state the value of the vertex of $f(x)$ in terms of the coefficients a and b for each situation.

(a) $f(x)$ has a maximum value at its vertex.

(b) $f(x)$ has a minimum value at its vertex.

3. Sketch of the graph of $f(x) = x^2 - 10x + 25$. Include the vertex, axis of symmetry, and any *x-intercepts*.

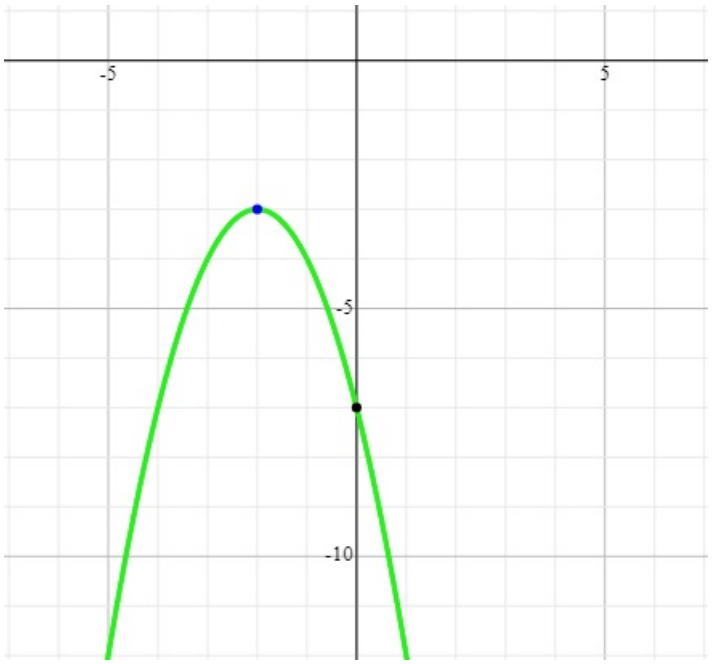
4. Consider the quadratic function $f(x) = x^2 - 6x$.

(a) Graph $f(x)$. Include the vertex, axis of symmetry, and any *x-intercepts* and *y-intercepts*.

(b) Determine the Domain and Range of $f(x)$.

5. Write a quadratic function where the vertex is $(2, -8)$ and the *y-intercept* is $(0, -4)$.

6. Find the quadratic function with the following graph.



7. State if the given quadratic functions have a maximum or minimum value and find the function's value at that point.

(a) $f(x) = 2x^2 + 8x + 3$

(b) $f(x) = -3x^2 + 12x - 2$

8. Find the coefficients values a, b, c for the function $f(x) = ax^2 + bx + c$ that has a vertex at $(0, 3)$ and passes through the point $(1, 7)$.