Name:_____ Date:_____

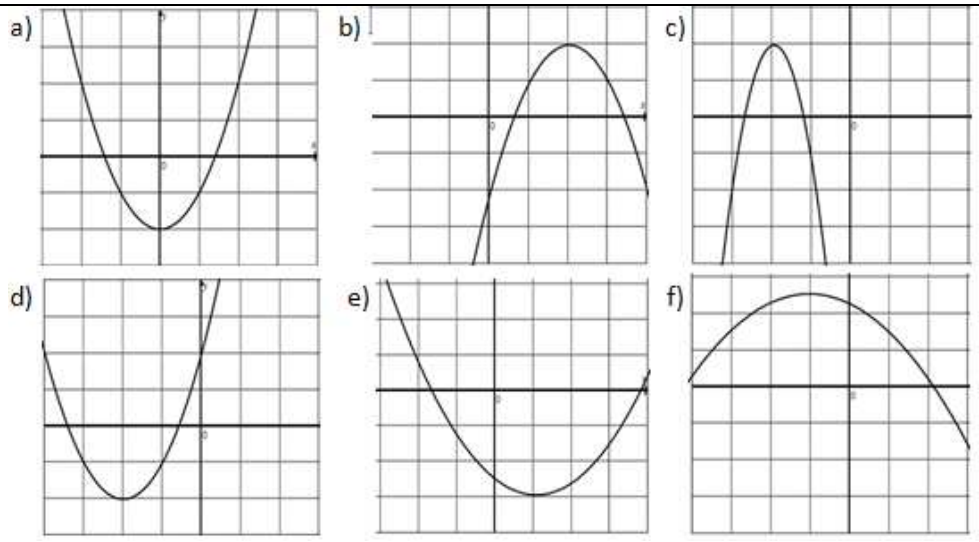
**Pre-Calculus 11 Ch3/4 HW Lesson 5 Quadratic Functions in Standard Form** $y = a(x-p)^2 + q$

1. Indicate the values of "a", "p", "q" and the coordinates of the vertex in each equation:

| | | |
|---|---|---|
| a) $y = 3(x-4)^2 + 8$<br>$a =$ $p =$ $q =$<br>*Vertex*: | b) $y = 2(x+6)^2 - 13$<br>$a =$ $p =$ $q =$<br>*Vertex*: | c) $y = -4x^2 + 10$<br>$a =$ $p =$ $q =$<br>*Vertex*: |
| d) $y = 21-(x-1)^2$<br>$a =$ $p =$ $q =$<br>*Vertex*: | e) $y = 4(x-20)^2 + 11$<br>$a =$ $p =$ $q =$<br>*Vertex*: | f) $y = (-3x)^2 + 2$<br>$a =$ $p =$ $q =$<br>*Vertex*: |
| g) $y = -\frac{2}{3}(x-1)^2 - 2$<br>$a =$ $p =$ $q =$<br>*Vertex*: | h) $y = -3\left(x+\frac{2}{3}\right)^2 - 2$<br>$a =$ $p =$ $q =$<br>*Vertex*: | I) $y = (2x-1)^2 - 3$<br>$a =$ $p =$ $q =$<br>*Vertex*: |

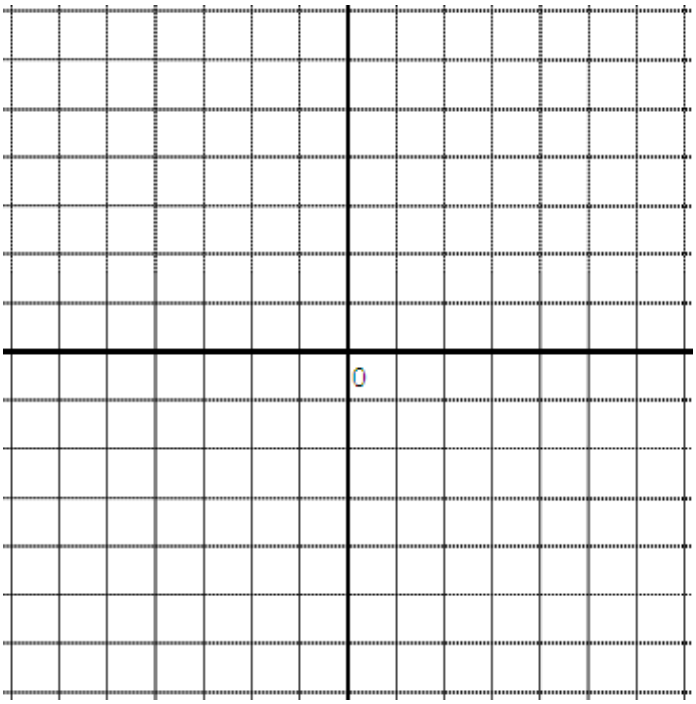
2. If each parabola is in the form of $y = a(x-p)^2 + q$, then which graph best describes each equation:

| | |
|---|---|
| i) $a < -1, p < 0, q > 0$ | |
| ii) $0 < a < 1, p > 0, q < 0$ | |
| iii) $a > 0, p = 0, q < 0$ | |
| iv) $0 > a > -1, p < 0, q > 0$ | |

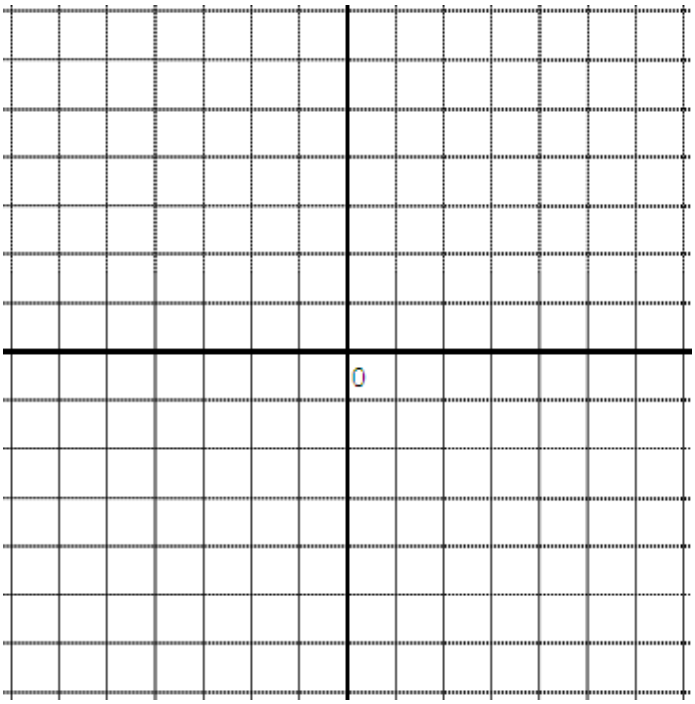


3. Graph each of the following quadratic functions and label the following: Equation of the Axis of Symmetry, Coordinates of the Vertex, and location of the X and Y-intercepts. Do **NOT** use a graphing calculator:

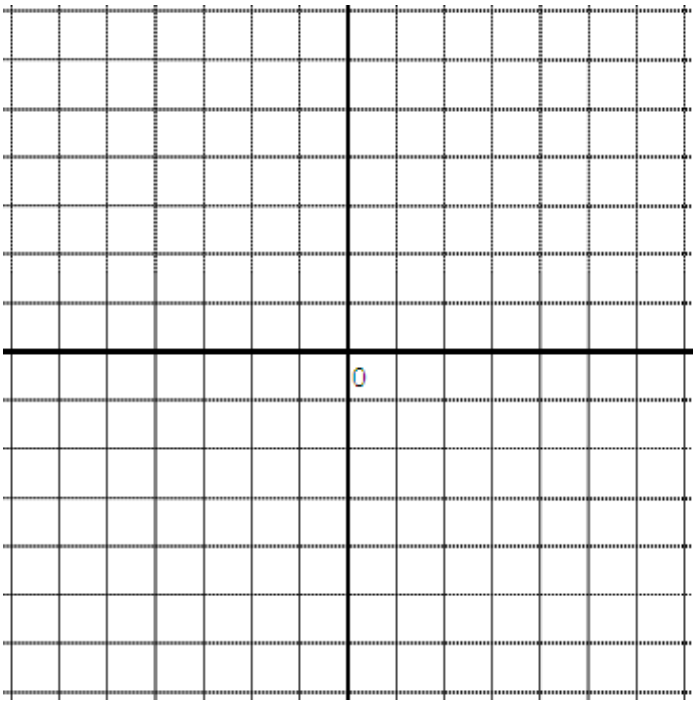
a) Equation: $y=(x-4)^2-5$



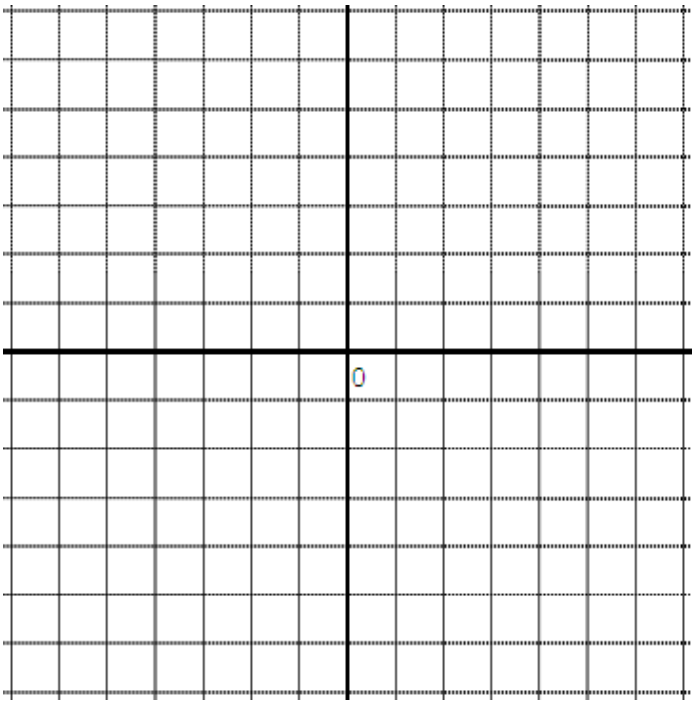

b) Equation: $y=-(x+3)^2+6$



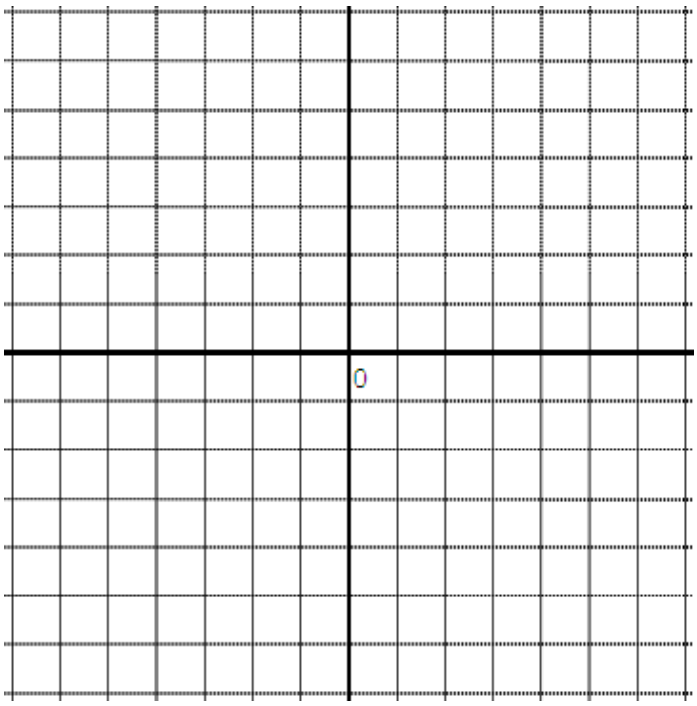

c) Equation: $y=\frac{1}{3}(x+3)^2+1$



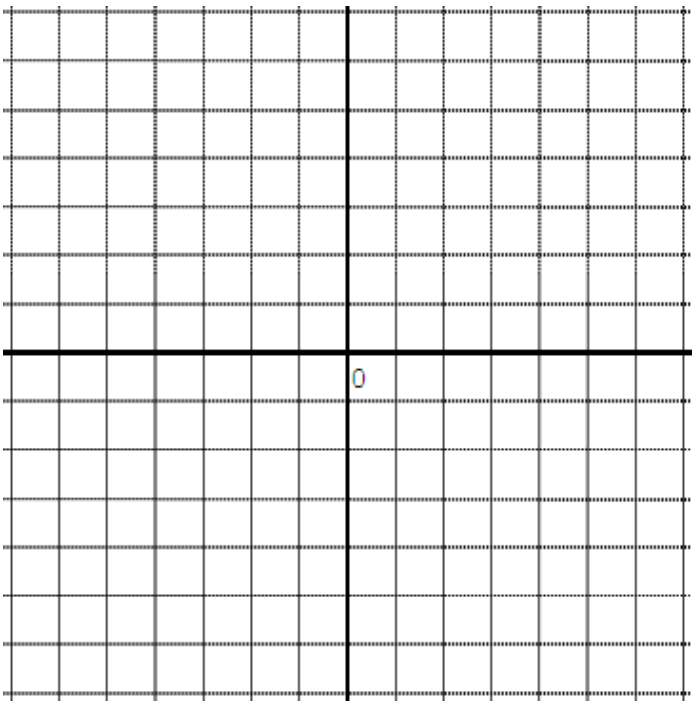

d) Equation: $y=-\frac{1}{2}(x-2)^2+7$



e) Equation: $y = 3(x-2)^2 - 5$




f) Equation: $y = -0.25(2x-6)^2 + 3$ (challenge)




4. What does it mean when two parabola functions are congruent?

5. How can the constant "a" in the equation $y = a(x-p)^2 + q$ determine the shape of a parabola? Explain:

6. If a parabola has a maximum value, then which way does the graph open? UP or DOWN? Explain?

7. Given the parabola: $y = -2(x-3)^2 + 4$ , what is the AXIS of Symmetry?

8. The parabola $y = x^2$ is shifted 4 units to the right, 3 units down, and then flipped upside down over its vertex. What is the equation of the parabola now in APQ form?

9. The parabola $y = x^2 - 2x + 4$ is moved *"p"* units to the right and *"q"* units down. The x-intercepts of the resulting parabola are 3 and 5. What are the values of "*p*" and "*q*"?

10. Given the parabola, what is the vertex and axis of symmetry? $y = 4x^2 + 4x + 9$

11. If the quadratic equation $(x-2)^2 + k = 0$ has two distinct real roots, then what is the range of "k"? (Multiple choice, circle one) Justify your answer.
    a) $k > 2$ b) $k < 0$ c) $k \le 0$ d) $k \le 4$

12. Point "A" is the vertex of the parabola $y = x^2 + 2$, point "B" is the vertex of the parabola $y = (x-3)^2 + 2$, and "O" is the origin. Determine the area of $\triangle AOB$.

13. Given the parabola: $y = 3(x-4)^2 - q$ with $1 < q < 50$. If both x-intercepts are positive integers, then what are the possible values of "q"?