

Key

Chapter 3 Review

3.1 Investigating Quadratic Functions in Vertex Form, pages 107-119

1. For each of the following, determine the number of x -intercepts, the equation of the axis of symmetry, and the domain and range.

a) $y = -2(x + 5)^2 + 6$

vertex $(-5, 6)$

① Two x -intercepts

② $x = -5$

③ $D: \mathbb{R}$

④ $R: y \leq 6$

b) $y = 5(x - 8)^2$ vertex $(8, 0)$

① One x -intercept

② $x = 8$

③ $D: \mathbb{R}$

④ $R: y \geq 0$



2. For each of the following, determine the coordinates of the vertex and whether the graph has a maximum or minimum value.

a) $y = -(x - 3)^2 - 7$

Vertex $(3, -7)$

opens down

so has a

max value of -7

b) $y = 0.5(x + 11)^2 + 8$

vertex $(-11, 8)$

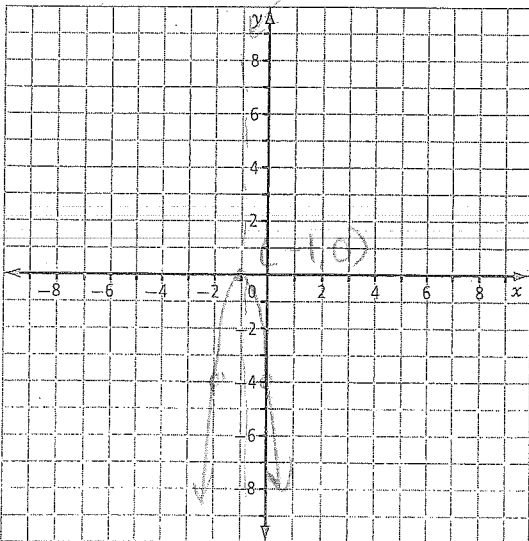
opens up

so has a

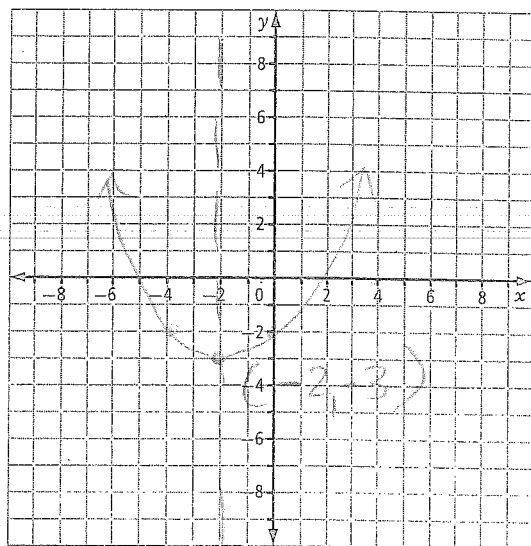
min value of 8

3. Sketch each of the following functions. Label the vertex and axis of symmetry.

a) $y = -4(x + 1)^2$



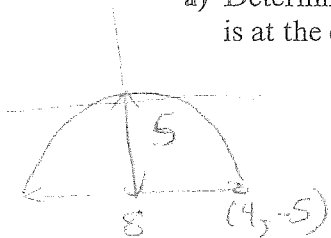
b) $y = \frac{1}{4}(x + 2)^2 - 3$



$x = -2$

4. Suppose a sculptor wants to create a parabolic arch with a height of 5 m and a width at the base of 8 m.

- a) Determine the quadratic function that represents the arch if the vertex of the parabola is at the origin.



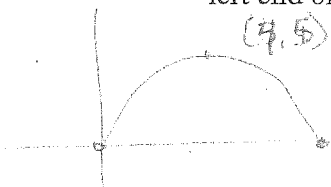
$$y = ax^2$$

$$-5 = a(16)$$

$$a = -5/16$$

$$y = -\frac{5}{16}x^2$$

- b) Determine the quadratic function that represents the arch if the origin is at the lower left end of the arch.



$$y = -\frac{5}{16}(x-4)^2 + 5$$

- c) Explain the similarities and differences between your two functions.

→ Same stretch & direction of opening $(-5/16)$
 → Different vertex

3.2 Investigating Quadratic Functions in Standard Form, pages 120-132

5. State the x-intercepts and y-intercept for each function.

a) $y = x^2 + 2x - 8$

b) $y = x^2 + 10x + 9$

y int: $(0, -8)$

y int $(0, 9)$

x int: $(-4, 0)$ and $(2, 0)$

x int $(-1, 0)$ and $(-9, 0)$

6. Determine the x-coordinate of the vertex of each of the quadratic functions.

a) $y = 2x^2 + 6x - 5$

b) $y = -3x^2 - 5x + 9$

$x = -3/6 = -0.5$

$x = -5/6 = -0.833$

$x = -1.5$

$x = -0.833$

7. State the equation of the axis of symmetry and the direction of opening for each quadratic function.

a) $y = -0.5x^2 - 5x + 2$

b) $y = 6x^2 - 8x - 11$

OPENS DOWN

OPENS UP

a.o.f.s: $x = -5$
 (-4.999)

a.o.f.s: $x = 0.667$

3.3 Completing the Square, pages 133-141

8. Write each function in vertex form. State the domain and range.

a) $y = x^2 + 6x + 15$

$y = (x^2 + 6x + 9) - 9 + 15$

$y = (x + 3)^2 + 6$ D: \mathbb{R}

vertex $(-3, 6)$ R: $y \geq 6$

b) $y = -3x^2 - 36x - 100$

$y = -3(x^2 + 12x + 36) + 108 - 100$

$y = -3(x + 6)^2 + 8$

vertex $(-6, 8)$ D: \mathbb{R} R: $y \leq 8$

c) $y = 2x^2 - 16x + 22$

d) $y = \frac{1}{2}x^2 - x + 3$

9. The profit, p , earned from the sale of a particular product by a business is given by $p(d) = -0.25d^2 + 5d + 80$, where d is the number of days the product has been for sale.

a) Determine the vertex of the profit function.

$(10, 105)$

b) Explain what the vertex means in the context of this problem.

Profit reaches a peak on the 10th day & then sales go down.

10. A student club is planning a fundraising car wash. Last year they charged \$10 per vehicle and washed 120 vehicles. They would like to earn more money this year. For every \$1 increase in price, they know they will wash 5 fewer vehicles.

a) Write a quadratic function to model this situation using v as the number of vehicles and r as the revenue.

OMIT

b) Determine the best price to charge for the car wash and the revenue expected at that price.