Lesson 17

Quadratic Functions
– Finding the Rule

Finding the Rule of a Quadratic Function – Standard form

Given the VERTEX (h,k) and a POINT (x,y)

Step 1:   Replace the VERTEX (h,k) into the Rule:
            f(x) = a(x - h)^2 + k

Step 2:   Replace the POINT (x,y) into the Rule

Step 3:   Solve for "a"

Step 4:   Write the RULE

Finding the Rule of a Quadratic Function – Standard form

Given the VERTEX (h,k) and a POINT (x,y)

Ex 1: Find the rule of a quadratic function which has a vertex (3,4) & passes through the point (7,2).

Step 1: $f(x) = a(x-h)^2 + k \Rightarrow f(x) = a(x-3)^2 + 4$

Step 2: $\Rightarrow 2 = a(7-3)^2 + 4$

Step 3: $2 = a(4)^2 + 4$
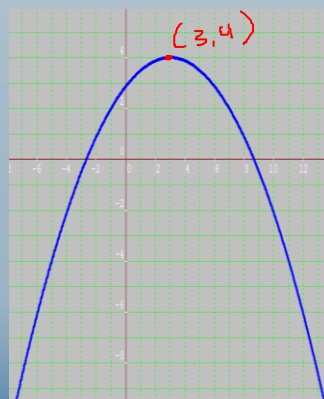
$-2 = a(4)^2$

$-2 = 16a$

$-\dfrac{1}{8} = a$

Step 4: $\Rightarrow f(x) = -\dfrac{1}{8}(x-3)^2 + 4$

Finding the Rule of a Quadratic Function – Standard form

Given the VERTEX (h,k) and a POINT (x,y)

Ex 1: Find the rule of a quadratic function which has a vertex (3,4) & passes through the point (7,2).

$f(x) = -\dfrac{1}{8}(x-3)^2 + 4$

(3,4)

Finding the Rule of a Quadratic Function – Standard form

$h \ k$

$(0, 7)$

Ex 2: A parabola with vertex V(2,11) has a y-intercept equal to 7. What is the y-coordinate of the point A on the parabola whose x-coordinate is 5.

Step 1: $\quad f(x) = a(x-h)^2 + k \Rightarrow f(x) = a(x-2)^2 + 11$

Step 2: $\quad \Rightarrow 7 = a(0-2)^2 + 11$

Step 3:
$$7 = a(-2)^2 + 11$$
$$-4 = a(-2)^2$$
$$-4 = 4a$$
$$-1 = a$$

Step 4:
$$\Rightarrow f(x) = -(x-2)^2 + 11$$

Finding the Rule of a Quadratic Function – Standard form

Ex 2: A parabola with vertex V(2,11) has a y-intercept equal to 7. What is the y-coordinate of the point A on the parabola whose x-coordinate is 5.

$$f(x) = -(x-2)^2 + 11$$
$$\Rightarrow y = -(5-2)^2 + 11$$
$$y = -(3)^2 + 11$$
$$y = -9 + 11$$
$$y = 2$$

Finding the Rule of a Quadratic Function – Standard form

Ex 3: What are the zeros of the parabola with vertex V(-4,8) and passes through the point A (3, -90)?

Step 1: $f(x) = a(x-h)^2 + k \Rightarrow f(x) = a(x+4)^2 + 8$

Step 2: $\Rightarrow -90 = a(3+4)^2 + 8$

Step 3:
$$-90 = a(7)^2 + 8$$
$$-98 = a(7)^2$$
$$-98 = 49a$$
$$-2 = a$$

Step 4:
$$\Rightarrow f(x) = -2(x+4)^2 + 8$$

Finding the Rule of a Quadratic Function – Standard form

Ex 3: What are the zeros of the parabola with vertex V(-4,8) and passes through the point A (3, -90)?

Step 4: $f(x) = -2(x+4)^2 + 8$

$$x_1 = h - \sqrt{-\frac{k}{a}} = -4 - \sqrt{-\frac{8}{-2}} = -4 - \sqrt{4} = -6$$

$$x_2 = h + \sqrt{-\frac{k}{a}} = -4 + \sqrt{-\frac{8}{-2}} = -4 + \sqrt{4} = -2$$

$$0 = -2(x+4)^2 + 8$$
$$-8 = -2(x+4)^2$$
$$4 = (x+4)^2$$

$$\pm 2 = x+4$$

Case 1
$$2 = x+4$$
$$x = -2$$

Case 2
$$-2 = x+4$$
$$x = -6$$

Homework

Workbook

P. 97 #8, 9 & 10
P. 98 #21
P. 99 #22-28