Math 20-2

15 – Worksheet

Part 1 – Starting with Standard Form

Use the following information to answer Q1-4:

$$f(x) = 2x^2 + 3x - 20$$

Q1: Determine the y-intercept of this function.

y-intercept is -20

Q2: Convert to *Factored Form* to determine the zeroes (x-intercepts) of the function.

$f(x) = 2x^2 + 3x - 20$

$\square + \square = 3$ -5 +8

$\square \times \square = -40$

1, 40
2, 20
4, 10
5, 8

$0 = 2x^2 - 5x + 8x - 20$

$0 = (2x^2 - 5x) + (8x - 20)$

$0 = x(2x - 5) + 4(2x - 5)$

$0 = (2x - 5)(x + 4)$

$2x - 5 = 0$ $x + 4 = 0$

$\boxed{x = 5/2}$ $\boxed{x = -4}$

Q3: Using the x-intercepts, determine the coordinates of the vertex.

Find axis of symmetry

$\dfrac{(5/2) + (-4)}{2} = -0.75$

$x = -0.75$

$f(x) = 2x^2 + 3x - 20$

$f(-0.75) = 2(-0.75)^2 + 3(-0.75) - 20$

$= 1.125 - 2.25 - 20$

$= -21.125$

Vertex at $(-0.75, -21.125)$

Q4: Using the coordinates of the vertex, write as *Vertex Form*.

$f(x) = a(x - h)^2 + k$ vs $f(x) = ax^2 + bx + c$

So $a = 2$ since $f(x) = 2x^2 + 3x - 20$

$f(x) = 2(x + 0.75)^2 - 21.125$

Part 2 – Starting with Vertex Form

Use the following information to answer Q5-9:

$$f(x) = -2(x + 3)^2 + 8$$
$$f(x) = a\,(x-h)^2 + k$$

Q5: Determine the coordinate of the vertex.

$$(-3, 8)$$

Q6: Determine the x-intercept(s) of this function. (Set $y=0$)

$$0 = -2(x+3)^2 + 8$$
$$-8 \qquad\qquad -8$$
$$-8 = -2(x+3)^2$$
$$\div(-2) \quad \div(-2)$$
$$4 = (x+3)^2$$
$$\sqrt{4} = (x+3)$$

$$+2 = x+3 \qquad -2 = x+3$$
$$\boxed{-1 = x} \qquad \boxed{-5 = x}$$

Q7: Determine the y-intercept of this function. (Set $x=0$)

$$f(0) = -2(0+3)^2 + 8$$
$$f(0) = -2(9) + 8$$
$$= -18 + 8$$
$$= -10$$

Q8: Convert to Standard Form to confirm the y-intercept.

$$f(x) = -2(x+3)(x+3) + 8$$
$$= -2(x^2+6x+9) + 8$$
$$= -2x^2 - 12x - 18 + 8$$
$$= -2x^2 - 12x - 10$$
$$\downarrow$$
y-intercept is -10

Q9: Convert to Factored Form to confirm the x-intercept(s).

$$f(x) = -2x^2 - 12x - 10$$
$$= -2(x^2+6x+5)$$
$$= -2(x+1)(x+5)$$

$$\begin{array}{cc} +1 & +5 \\ \square + \square = 6 \\ \square \times \square = 5 \end{array}$$

$$x+1 = 0 \qquad x+5 = 0$$
$$\boxed{x = -1} \qquad \boxed{x = -5}$$

■ KEY ■

Part 3 – *Starting with Factored Form*

Use the following information to answer Q10-13:

$$f(x) = 3(x - 1)(x + 5)$$

Q10: Determine the x-intercept(s) of this function. *(Set y = 0)*

$$0 = 3(x-1)(x+5)$$

$x-1 = 0 \qquad x+5 = 0$

$\boxed{x = 1} \qquad \boxed{x = -5}$

Q11: Using the x-intercepts, determine the coordinates of the vertex.

$$\frac{(1) + (-5)}{2} = -2 \qquad \boxed{x = -2}$$

Axis of symmetry

$$f(-2) = 3(-2-1)(-2+5)$$
$$= 3(-3)(3)$$
$$= 27$$

Vertex at $(-2, 27)$

Q12: Determine the y-intercept of this function. *(Set x = 0)*

$$f(0) = 3(0-1)(0+5)$$
$$= 3(-1)(5)$$
$$= -15$$

Q13: Convert to Standard Form to confirm the y-intercept.

$$f(x) = 3(x-1)(x+5)$$
$$= 3(x^2 + 4x - 5)$$
$$= 3x^2 + 12x - 15$$

$\downarrow$

y-intercept to -15