Math 20-1

KEY

Lxx – Worksheet – Review of Quadratic Forms (Basics with No Graphing)

Part 1 – Starting with Standard Form

Use the following information to answer Q1-4:

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

Q1: Determine the x-intercept(s) and y-intercept of this function.

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

y-int (set $x = 0$)

$f(0) = 2(0)^2 + 3(0) - 20$

$= -20$

y-intercept is -20

x-intercepts (set $y = 0$)

$0 = 2x^2 + 3x - 20$

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \dfrac{-3 \pm \sqrt{9 - 4(2)(-20)}}{2(2)}$

$= \dfrac{-3 \pm \sqrt{9 + 160}}{4}$

$x_1 = \dfrac{-3 + \sqrt{169}}{4} = 2.5$

$x_2 = \dfrac{-3 - \sqrt{169}}{4} = -4$

x-intercepts (zeroes) are $-4, +2.5$

Q2: Using the x-intercepts, determine the coordinates of the vertex.

Vertex halfway between zeroes.

$\dfrac{(2.5) + (-4)}{2} = -0.75$

Axis of symmetry at $x = -0.75$

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

$= 1.125 - 2.25 - 20$

$= -21.125$

Vertex at $(-0.75, -21.125)$

Q3: Convert to Vertex Form to confirm the coordinates of the vertex.

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

$= 2(x^2 + 1.5x) - 20$

$= 2(x^2 + 0.75x + 0.75x) - 20$

$= 2(x^2 + 0.75x + 0.75x + 0.5625) - 20 - 1.125$

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

Vertex at $(-0.75, -21.125)$

Q4: Convert to Factored Form to confirm the x-intercepts.

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

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

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

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

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

-5 $+8$

$\square + \square = 3$

$\square \times \square = -40$

1, 40

2, 20

4, 10

5, 8

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

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

$2x - 5 = 0$

$x = 5/2$ or 2.5

$x + 4 = 0$

$x = -4$

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Part 2 – Starting with Vertex Form

Use the following information to answer Q5-9:

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

Q5: Determine the coordinate of the vertex.

$f(x) = -2(x - -3) + 8$

Vertex at $(-3, 8)$

Q6: Determine the x-intercept(s) of this function.

x-intercepts (set $y=0$)

$0 = -2(x+3)^2 + 8$

$-8 \qquad -8$

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

$\div(-2) \quad \div(-2)$

$4 = (x+3)^2$

$\pm\sqrt{4} = x+3$

$+2 = x+3$

$-3 \qquad -3$

$-1 = x$

$-2 = x+3$

$-3 \qquad -3$

$-5 = x$

so $x = -5, -1$

Q7: Determine the y-intercept of this function.

y-intercept (set $x=0$)

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

$= -2(9) + 8$

$= -18 + 8$

$= -10$

y-intercept is -10

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

$f(x) = -2(x+3)(x+3) + 8$

$= -2(x^2+6x+9) + 8$

$= -2x^2 - 12x - 18 + 8$

$f(x) = -2x^2 - 12x - 10$

y-intercept

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

$f(x) = -2x^2 - 12x - 10$

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

$f(x) = -2(x+5)(x+1)$

x-intercept (set $y=0$)

$0 = -2(x+5)(x+1)$

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

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

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Part 3 – Starting with Factored Form

Use the following information to answer Q10-14:

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

Q10: Determine the x-intercept(s) of this function.

x-intercepts (set $y=0$)

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

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

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

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

Vertex is halfway between zeroes (x-ints)

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

Axis of symmetry at $x=-2$.

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

$= 3(-3)(3)$

$= -27$

Vertex at $(-2, -27)$

Q12: Determine the y-intercept of this function.

y-intercept (set $x=0$)

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

$= 3(-1)(5)$

$= -15$

y-intercept at $y=-15$.

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

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

$= 3(x^2+4x-5)$

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

y-intercept

Q14: Convert to Vertex Form to confirm the coordinates of the vertex.

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

$= (3x^2+12x) - 15$

$= 3(x^2+4x) - 15$

$= 3(x^2+2x+2x) - 15$

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

$f(x) = 3(x+2)^2 - 27$

Vertex at $(-2, -27)$