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Quadratics QUEST
Mid-Unit Lessons #1-4

*Countout of
22

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1. Given the equation $y = 2(x+2)^2 - 2$, provide the following: (10 points)

a. Coordinates of the vertex

$(-2, -2)$ ⊕

b. Direction of opening

up ⊕

c. Max/min value

min @ -2 ⊕

d. Equation of the axis of symmetry

$x = -2$ ⊕

e. Coordinates of the y-intercept

$(0, 6)$ ⊕

f. Coordinates of the x-intercepts

$(-1, 0)$ ⊕ $(-3, 0)$ ⊕
 $x = -1$ $x = -3$

$$\begin{aligned} 0 &= 2(x+2)^2 - 2 \\ 2 &= \frac{2(x+2)^2}{2} \quad \sqrt{(x+2)^2} = \sqrt{1} \\ x+2 &= \pm 1 \end{aligned}$$

$x = -2 \pm 1$

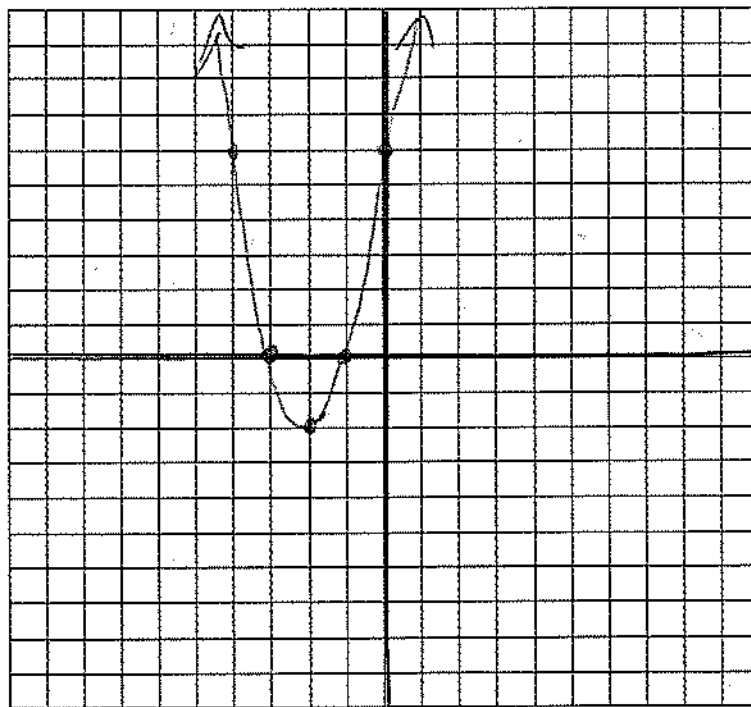
g. Domain of the function

$x = \mathbb{R}$ ⊕

h. Range of the function

$y \geq -2$ ⊕

i. Sketch of the function



⊕

10

rewrite as: $y = -\frac{1}{2}(x-2)^2 + 8$

2. Given the equation $-2y = (x-2)^2 - 16$, provide the following: (10 points)

a. Coordinates of the vertex

$(2, 8)$ ✓

b. Direction of opening

down ✓

c. Max/min value

max @ 8 ✓

d. Equation of the axis of symmetry

$x = 2$ ✓

e. Coordinates of the y-intercept

$(0, 6)$ ✓

f. Coordinates of the x-intercepts

$(-2, 0)$ ✓ $(6, 0)$ ✓

$$0 = -\frac{1}{2}(x-2)^2 + 8$$

$$-8 = -\frac{1}{2}(x-2)^2$$

$$\sqrt{(x-2)^2} = \sqrt{16}$$

$$x-2 = \pm 4 \quad x = 2 \pm 4$$

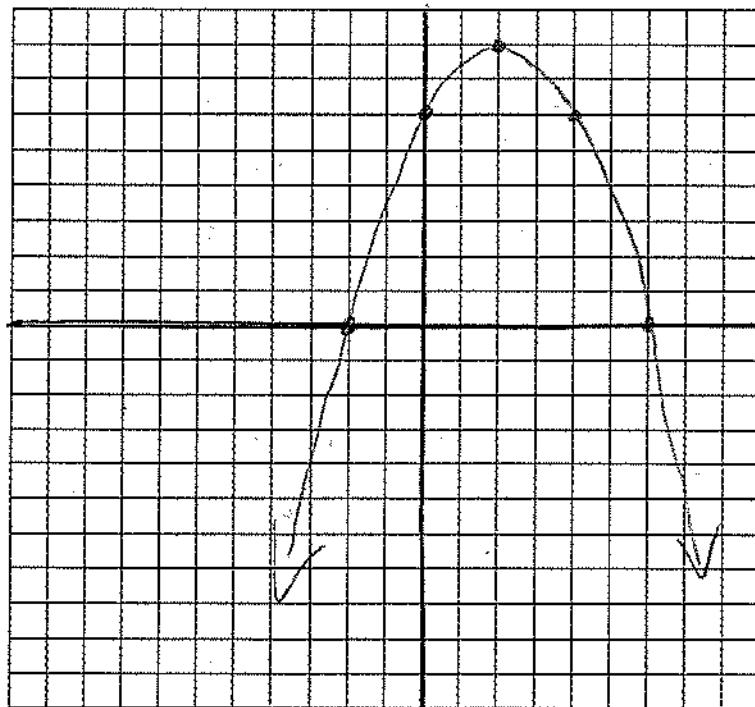
g. Domain of the function

$x \in \mathbb{R}$ ✓

h. Range of the function

$y \leq 8$ ✓

i. Sketch of the function



✓

10

3. Given that the vertex of a particular quadratic is (2, 6) and a second point on the graph is (5, 7), determine the equation of the quadratic in standard form. (2 points)

$$p=2$$

$$q=6$$

$$x=5$$

$$y=7$$

$$a=?$$

$$y = a(x-p)^2 + q$$

$$7 = a(5-2)^2 + 6$$

$$7 = 9a + 6$$

$$1 = 9a$$

$$a = \frac{1}{9} \quad \checkmark$$

equation: $y = \frac{1}{9}(x-2)^2 + 6 \quad \checkmark$

4. Given that the vertex of a particular quadratic is (-4, 5) and the y-intercept is at -3, determine the equation of the quadratic in standard form. (2 points)

$$p=-4$$

$$q=5$$

$$x=0$$

$$y=-3$$

$$a=?$$

$$y = a(x-p)^2 + q$$

$$-3 = a(0-(-4))^2 + 5$$

$$-3 = 16a + 5$$

$$-8 = 16a$$

$$\frac{-8}{16} = \frac{16a}{16}$$

$$a = -\frac{1}{2} \quad \checkmark$$

equation: $y = -\frac{1}{2}(x+4)^2 + 5 \quad \checkmark$

5. For each of the following equations

i) Describe in mathematical terms the transformations on the parent function $y = x^2$. (7 points)

ii) Write the coordinates of the image of the point (-3, 9) (on the parent function) after each transformation has occurred (7 points)

a. $y = \frac{1}{3}(x+1)^2 - 5$

point

$$(-3, 3) \quad \checkmark$$

$$(-4, 3) \quad \checkmark$$

$$(-4, -2) \quad \checkmark$$

transformation

vertical compression by a factor of $\frac{1}{3}$ \checkmark

horizontal translation 1 unit left \checkmark

vertical translation 5 units down \checkmark

$$b. y = -2(x-4)^2 + 7$$

point

$$(-3, -9) \checkmark$$

$$(-3, -18) \checkmark$$

$$(1, -18) \checkmark$$

$$(1, -11) \checkmark$$

transformation

reflection on the x-axis \checkmark

vertical expansion by a factor of 2 \checkmark

horizontal translation 4 units right \checkmark

vertical translation 7 units up \checkmark

6. Determine the zeros of the function and y-intercepts of the graph of the function (6 points).

\rightarrow zeros = x-intercepts = roots.

a. $f(x) = 2x^2 - x - 15$

$$0 = 2x^2 - x - 15$$

$$0 = (x-3)(2x+5) \checkmark$$

zeros: $x = 3, -\frac{5}{2} \checkmark$

y-intercept: $y = -15 \checkmark$

b. $f(x) = 3x^3 - 48x$

$$0 = 3x^3 - 48x$$

$$0 = 3x(x^2 - 16)$$

$$0 = 3x(x+4)(x-4) \checkmark$$

zeros: $x = 0, -4, 4 \checkmark$

y-intercept: $y = 0 \checkmark$