Quadratics Unit Test Review **Name:** _____

Directions: Answer each question completely. Show ALL of your work!!!!

1) How does each differ from the parent function for quadratics? **Do NOT use a calculator!**

a. $f(x) = -2x^2 + 4$ The graph is concave down, stretched from x-axis (skinny) and moved up 4 units.

b. $f(x) = (x+3)^2 - 10$ The points on the parabola have all moved left 3 units and down 10 units.

2) Graph each function. Show your work!!!!! **Do NOT use a calculator!**

a. $f(x) \geq 2x^2 - 4x - 5$ $x = \frac{-b}{2a} = \frac{4}{2(2)} = \frac{4}{4} = 1$

$y = 2(1)^2 - 4(1) - 5 = 2 - 4 - 5 = -7$

Vertex: $(1, -7)$

Axis of Symmetry: $x = 1$

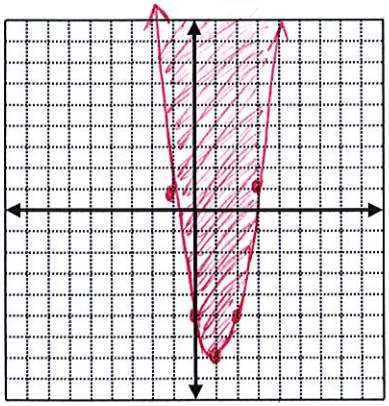
Y-intercept: $(0, -5)$: constant

Point: $2(1)^2 = 2(1) = 2$ move over 1 from vertex, move up 2 from vertex

Min/Max: Min

Domain: $-\infty < x < \infty$

Range: $-7 \leq y < \infty$



Test (0,0)

$0 > -5$

true

b. $f(x) < -(x+4)^2 + 2$

Vertex: $(-4, 2)$

Axis of Symmetry: $x = -4$

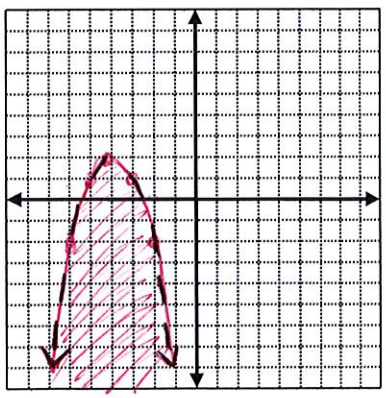
Point: $-1(1)^2 = -1(1) = -1$

Point: $-1(2)^2 = -1(2) = -4$

Min/Max: Max

Domain: $-\infty < x < \infty$

Range: $-\infty < y \leq 2$



Test (0,0)

$0 < -16 + 2$

$0 < -14$

false

3) Rewrite the following equation in vertex form. $f(x) = -4x^2 + 16x - 12$ $y = -4(x-2)^2 + 4$

a!

Find vertex $x = \frac{-b}{2a} = \frac{-16}{2(-4)} = \frac{-16}{-8} = 2$

$y = -4(2)^2 + 16(2) - 12$

$-4(4) + 16(2) - 12$

$-16 + 32 - 12 = 4$

undo P E MD AS ↑

4) Solve using **SQUARE ROOTS**. Leave answers in simplest radical terms if necessary.

a. $x^2 - 4 = 5$ $x = \pm 3$

$+4 \quad +4$

$x^2 = 9$

$\sqrt{x^2} = \pm\sqrt{9}$

$x = \pm 3$

b. $4(x-7)^2 = 784$ $x = -7$ and $x = 21$

$\frac{4}{4} \quad \frac{4}{4}$

$\sqrt{(x-7)^2} = \sqrt{196}$

$x - 7 = -14$ and 14

$+7 \quad +7 \quad +7$

c. $5x^2 + 25 = 0$ $x = \pm i\sqrt{5}$

$-25 \quad -25$

$\frac{5x^2}{5} = \frac{-25}{5}$

$\sqrt{x^2} = \sqrt{-5}$

$x = \pm i\sqrt{5}$

d. $3(x+10)^2 = -243$ $x = -10 \pm 9i$

$\frac{3}{3} \quad \frac{-243}{3}$

$\sqrt{(x+10)^2} = \sqrt{-81}$

$x + 10 = \pm 9i$

$-10 \quad -10$

e. $5x^2 + 18 = -117$ $x = \pm 3i\sqrt{3}$

$-18 \quad -18$

$\frac{5x^2}{5} = \frac{-135}{5}$

$\sqrt{x^2} = \sqrt{-27}$

$x = \pm 3i\sqrt{3}$

f. $(x+4)^2 + 6 = 51$ $x = -4 \pm 3\sqrt{5}$

$-6 \quad -6$

$\sqrt{(x+4)^2} = \sqrt{45}$

$x + 4 = \pm 3\sqrt{5}$

$-4 \quad -4$

5) Solve by **FACTORING**. (means find x-intercepts.)

a. $x^2 - 3x = 40$ ~~x~~ $(8,0)$ $(-5,0)$ $y=0$

$x^2 - 3x - 40 = 0$

$(x-8)(x+5) = 0$

$x = 8 \quad x = -5$

b. $2x^2 + 27 = -21x$ $(-9,0)$ $(-\frac{3}{2},0)$

$2x^2 + 21x + 27 = 0$

54 | 21

3(18)

	2x	3
x	$2x^2$	3x
9	18x	27

$(2x+3)(x+9) = 0$

$-\frac{3}{2} \quad -9$

c. $72x^2 - 32x = 0$ $(0,0)$ $(\frac{4}{9},0)$

$8x(9x-4) = 0$

$x = 0 \quad x = \frac{4}{9}$

no constant, y-int = 0 = origin

d. $2x^2 = 5x + 3$ $(-1/2,0)$ $(3,0)$

$2x^2 - 5x - 3 = 0$

$-6 \quad -5$

$-6(1)$

	x	-3
2x	$2x^2$	-6x
1	x	3

$(x-3)(2x+1) = 0$

$3 \quad -\frac{1}{2}$

e. $3x^2 + 6x = 72$ $(-6,0)$ $(4,0)$

$3x^2 + 6x - 72 = 0$

$3(x^2 + 2x - 24) = 0$

$3(x+6)(x-4) = 0$

$-6 \quad 4$

f. $4x^3 - 140x = 8x^2$ $(0,0)$ $(7,0)$ $(-5,0)$

add x, sorry for typo.

$4x^3 - 8x^2 - 140x = 0$

$4x(x^2 - 2x - 35) = 0$

$4x(x-7)(x+5) = 0$

$0 \quad 7 \quad -5$

6) Find the number of solutions of each equation. Show your work!!!!

a. $x^2 + 10x + 6 = 0$ 2 real

b^2-4ac

$10^2-4(1)(6)$

$100-24 = 76$

b. $-9x^2 - 25x + 20 = 0$ 2 real

b^2-4ac

$(-25)^2-4(-9)(20)$

$625-(-720) = 1345$

c. $-3x^2 + 27x = -40$ 2 real

b^2-4ac

$(27)^2-4(-3)(40)$

$729-(-480) = 1209$

d. $0 = -4x^2 - 5x - 2$ 2 imaginary

b^2-4ac

$(-5)^2-4(-4)(-2)$

$25-32 = -7$

7) Solve each equation using the **QUADRATIC FORMULA.** Keep answers in radical form.

a. $x^2 - 18x - 24 = 0$ $9 \pm \sqrt{105}$

$x = \frac{18 \pm \sqrt{(-18)^2-4(1)(-24)}}{2(1)}$ $x = \frac{18}{2} \pm \frac{2\sqrt{105}}{2}$

$x = \frac{18 \pm \sqrt{324-(-96)}}{2}$

$x = \frac{18 \pm \sqrt{420}}{2}$

420 → 2·210 → 2·105 → 3·35 → 5·7

b. $-x^2 + 8x + 4 = 5$ $4 \pm \sqrt{15}$

$-5 \quad -5$

$x = \frac{-8 \pm \sqrt{8^2-4(-1)(-1)}}{2(-1)}$

$x = \frac{-8 \pm \sqrt{64-4}}{-2}$

$x = \frac{-8 \pm \sqrt{60}}{-2}$

60 → 2·30 → 2·15 → 3·5

$x = \frac{-8}{-2} \pm \frac{2\sqrt{15}}{-2}$

c. $2x^2 + 3 = 7x$ $(3,0)$ $(\frac{1}{2},0)$

$-7x \quad -7x$

$x = \frac{7 \pm \sqrt{(-7)^2-4(2)(3)}}{2(2)}$ $x = \frac{7+5}{4} = 3$

$x = \frac{7 \pm \sqrt{49-24}}{4}$ $x = \frac{7-5}{4} = \frac{1}{2}$

$x = \frac{7 \pm \sqrt{25}}{4}$

d. $-2x = 3x^2 + 1$ $\frac{-1 \pm i\sqrt{2}}{3}$

$+2x \quad +2x$

$x = \frac{-2 \pm \sqrt{2^2-4(3)(1)}}{2(3)}$

$x = \frac{-2 \pm \sqrt{4-12}}{6}$

$x = -\frac{2}{6} \pm \frac{2i\sqrt{2}}{6}$

-8 → 2·4 → 2·2 → i i

e. $2x^2 + 8x - 2 = x^2 + 2x - 8$ $-3 \pm \sqrt{3}$

$-x^2 \quad -2x \quad +8 \quad -x^2 \quad -2x \quad +8$

$x^2 + 6x + 6 = 0$

$x = \frac{-6 \pm \sqrt{6^2-4(1)(6)}}{2(1)}$

$x = \frac{-6 \pm \sqrt{36-24}}{2}$ $x = \frac{-6 \pm \sqrt{12}}{2}$

$x = \frac{-6}{2} \pm \frac{2\sqrt{3}}{2}$

8) A ball follows the path of $h = -16t^2 + 40t$. Will it ever reach the height of 28 feet? no

find the vertex. Compare it to 28.

$x = \frac{-40}{2(-16)} = \frac{-40}{-32} = 1.25$

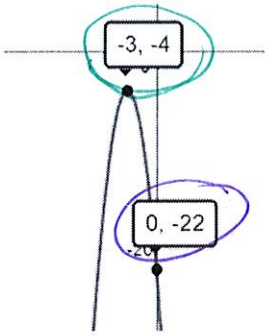
$y = -16(1.25)^2 + 40(1.25)$

$y = -25 + 50$

$y = 25$

$25 < 28$

9) Write the equation in vertex form for the following graph $y = -2(x+3)^2 - 4$



$y = a(x-h)^2 + k$

$y = a(x+3)^2 - 4$

$-22 = a(0+3)^2 - 4$

$-22 = a(3)^2 - 4$

$-22 = 9a - 4$

$+4 \quad +4$

$\frac{-18}{9} = \frac{9a}{9}$

$-2 = a$

10) Suppose you throw a ball in the air with an upward velocity of 30 ft/sec. The ball is 4 feet high when it leaves you hand. Use the equation $h = -16t^2 + 30t + 4$ to find the following. Do NOT round your answers.

a. How long does it take the ball to reach its maximum height? time = independent variable (t) .9375 sec.

$x = \frac{-b}{2a} = \frac{-30}{2(-16)} = \frac{-30}{-32} = .9375$

b. What is the maximum height of the ball? dependent (h) 18.0625 ft

$y = -16(.9375)^2 + 30(.9375) + 4 =$

c. How long is the ball in the air? throw to x-int. 2 seconds

$x = \frac{-30 \pm \sqrt{30^2 - 4(-16)(4)}}{2(-16)} = 2$