Algebra 2 Pre-Test 4 **Name:** Key

1. Use $y = (x-4)^2 - 1$ to complete the following:

a. Find the vertex. Is it a maximum or a minimum?

(4, -1) Min

b. Write in standard form.

$y = x^2 - 8x + 15$

$x^2 - 8x + 16 - 1$

c. Write in intercept form.

$y = (x-3)(x-5)$

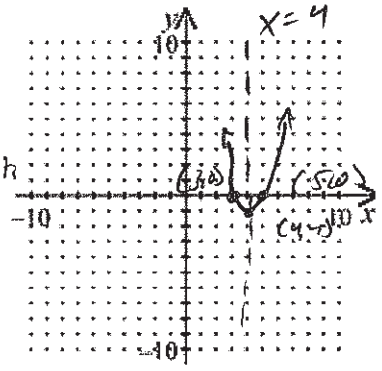
d. Compare to the parent graph $y = x^2$.

Opens up; same width; vertex shift right 4 units and down 1 unit

e. Find the zeros.

(3, 0) & (5, 0)

f. Graph the function and label the vertex, axis of symmetry, and the x-intercepts (zeros).



2. Use $y = (x+1)(x-3)$ to complete the following:

a. Find the vertex. Is it a maximum or a minimum?

(1, -4) Min

b. Write in standard form.

$y = x^2 - 2x - 3$

c. Write in vertex form.

$y = (x-1)^2 - 4$

d. Compare to the parent graph $y = x^2$.

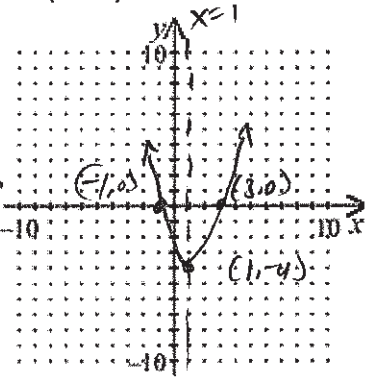
opens up; same width; vertex shift right 1 unit & down 4 units

e. Find the zeros.

(-1, 0) & (3, 0)

$\frac{3+-1}{2} = \frac{2}{2} = 1$

Graph the function and label the vertex, axis of symmetry, and the x-intercepts (zeros).



3. Use $-2x^2 - 8x - 6 = y$ to complete the following:

a. Find the vertex. Is it a maximum or a minimum?

(-2, 2) Max

b. Write in intercept form.

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

c. Write in vertex form.

$y = -2(x+2)^2 + 2$

d. Compare to the parent graph $y = x^2$.

Opens down; narrower; vertex shift left 2 units & up 2 units

e. Find the zeros.

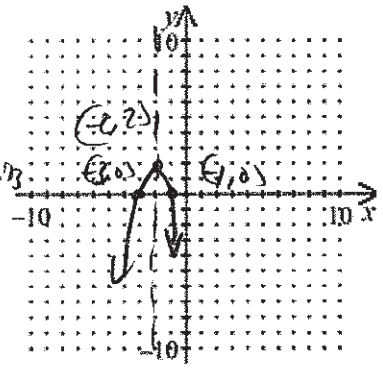
(-1, 0) & (-3, 0)

$\frac{8}{-2(2)} = \frac{8}{-4} = -2$

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

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

f. Graph the function and label the vertex, axis of symmetry, and the x-intercepts (zeros).



$x = -2$

4. Factor the following:

a. $x^2+9x+20$

$(x+4)(x+5)$

c. x^2-625

$(x-25)(x+25)$

e. x^2-2x-3

$(x-3)(x+1)$

b. $4x^2-18x+8$

$2(2x^2-9x+4)$

$2(2x-1)(x-4)$

d. $5x^2-125$

$5(x^2-25)$

$5(x-5)(x+5)$

f. $3x^2+9x-12$

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

$3(x-1)(x+4)$

5. Simplify the following:

a. $2\sqrt{10}\cdot\sqrt{15} = 10\sqrt{6}$

$2\cdot5 \quad 3\cdot5$

b. $\sqrt{\frac{35}{36}} = \frac{\sqrt{35}}{6}$

c. $\sqrt{98} = 7\sqrt{2}$

$2\cdot49$

d. $\frac{2}{4+\sqrt{11}} = \frac{8-2\sqrt{11}}{5}$

$\frac{2(4-\sqrt{11})}{4^2-(\sqrt{11})^2} = \frac{8-2\sqrt{11}}{16-11}$

6. Solve the following equations:

a. $5(r-2)^2=35$

$(r-2)^2=7$

$r-2=\pm\sqrt{7}$

$+2 \quad +2$

$r=2\pm\sqrt{7}$

b. $5x^2=80$

$x^2=16$

$x=\pm4$

c. $x^2-7=29$

$x^2=36$

$x=\pm6$

7. Write the expression as a complex number in standard form. $(-8-6i)-(7-5i) = -15-i$

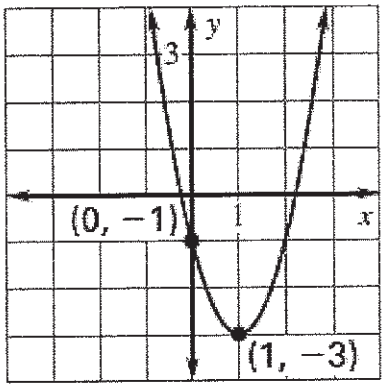
8. Write the expression as a complex number in standard form: $\frac{8+7i}{3-4i} = \frac{-4+53i}{25}$

9. Simplify: $(3-2i)^2 = 5-12i$

$y = 2(x-1)^2 - 3$

$y = 3(x-1)(x-4)$

10. *a.* Write an equation in vertex form from the graph.



$y = a(x-1)^2 - 3$

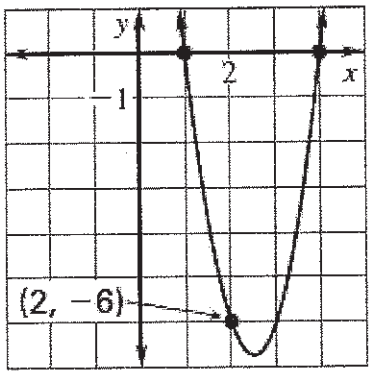
$-1 = a(0-1)^2 - 3$

$-1 = a(-1)^2 - 3$

$-1 = a - 3$

$2 = a$

b. Write an equation in intercept from the graph.



$y = a(x-1)(x-4)$

$-6 = a(2-1)(2-4)$

$-6 = a(1)(-2)$

$-6 = -2a$

$3 = a$

11. Solve and state the discriminant:

a. $\mathbf{11x^2 + 9x = -7}$

$x = \dfrac{-9 \pm \sqrt{9^2 - 4(11)(7)}}{22}$

$x = \dfrac{-9 \pm \sqrt{-227}}{22}$

Disc: -227

Zeros: $\dfrac{-9 \pm i\sqrt{227}}{22}$

b. $2x^2 + 22x + 20 = 0$

$x = \dfrac{-22 \pm \sqrt{22^2 - 4(2)(20)}}{4}$

$x = \dfrac{-22 \pm \sqrt{324}}{4} = \dfrac{-22 \pm 18}{4}$

Disc: 324

Zeros: $-1, -10$

12. A rock is thrown from the top of a tall building. The distance, in feet, between the rock and the ground t seconds after it is thrown is given by $d = \mathbf{-16t^2 - 4t + 412}$. How long after the rock is thrown is it 410 feet from the ground?

At 0.25 seconds the rock is 410 ft off the ground.

$410 = -16t^2 - 4t + 412$

$0 = -16t^2 - 4t + 2$

$t = \dfrac{4 \pm \sqrt{(-4)^2 - 4(-16)(2)}}{-32}$

$t = \dfrac{4 \pm 12}{-32}$ $\begin{matrix} -1/2 \\ 1/4 \end{matrix}$

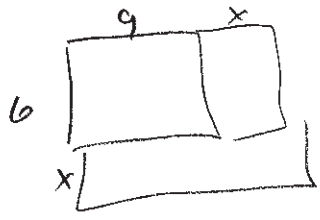
13. A restaurant has a patio that is 6 feet wide and 9 feet long. The restaurant owners want to double the area of the current patio by increasing the width and the length by the same distance x. Write an equation that x must satisfy and solve. Can your equation be solved by factoring? Is there a single solution or more than one solution? *Explain.*

a) $(9+x)(6+x) = 108$

$x = 3$ ft.

b) yes

c) One solution since cannot add negative ft.



$(9+x)(6+x) = 2(54)$

$54 + 15x + x^2 = 108$

$x^2 + 15x - 54 = 0$

$(x+18)(x-3) = 0$

$x = -18, 3$

14. Mr. Hill wants to try out for the Denver Broncos football team as starting QB. His strongest football throw is modeled with the equation $y = -\frac{1}{8}(x-15)^2 + 28.125$ where x is measured in time and y is measured in yards. How many yards can Mr. Hill throw at his best? How high does the ball go in the air? Would Mr. Hill make the football team? Explain.

a) 30 yds

b) 15 yds

c) Yes / No + why

$y = -1/8(x^2 - 30x + 225) + 28.125$

$y = -1/8\,x^2 + 3.75x - 28.125 + 28.125$

$y = -1/8\,x^2 + 3.75x$

$y = -1/8\,x(x - 30)$

15. Several ways of solving a quadratic equation were presented in this unit: graphing, factoring, using the quadratic formula, completing the square. Choose one of these methods and discuss the advantages and disadvantages.

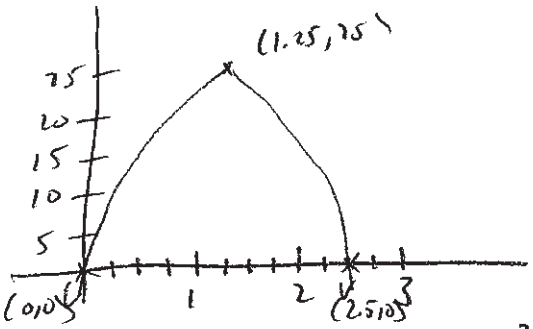
Method

Pro

Con

16. The height h of a soccer ball that is kicked from the ground with an initial velocity of 40 feet per second can be modeled by the equation $h = -16t^2 + 40t$ where t is time (in seconds).

a. Graph the function.



$h = -16t(t - 2.5)$

$t = 0, \quad t = 2.5$

$\frac{0 + 2.5}{2} = 1.25$

(1.25, 25) vertex

b. What is a reasonable domain for $h = -16t^2 + 40t$? Explain.

From 0 to 2.5 seconds since that is when the ball is in the air.

c. Write and solve an inequality to find at what times the soccer ball's height is greater than 10 feet.

$10 < -16t^2 + 40t$

$0.28 < t < 2.22$

$-16t^2 + 40t - 10 > 0$

$t = \frac{-40 \pm \sqrt{40^2 - 4(-16)(-10)}}{-32}$

$t = \frac{-40 \pm \sqrt{960}}{-32}$