Intermediate Algebra
Quadratic Review

Name: Key

1.) Graph the following on the back:

a) $y = (x-5)^2 + 2$

b) $y = -(x+2)^2 - 1$

c) $y = \frac{1}{3}x^2 + 2$

2.) Write each equation in vertex form.

a) $y = x^2 + 4x + 6$ $4 + y - 6 = x^2 + 4x + 4 \rightarrow y = (x+2)^2 + 2$

b) $y = \frac{1}{3}x^2 - 2x + 6$ $3 + y - 6 = \frac{1}{3}(x^2 - 6x + 9) \rightarrow y = \frac{1}{3}(x-3)^2 + 3$

c) $y = 3x^2 - 6x + 5$ $3 + y - 5 = 3(x^2 - 2x + 1) \rightarrow y = 3(x-1)^2 + 2$

3.) Graph the following to find the solutions: (graphs on back)

a) $y = -3x^2 + 3$ $x = 1, \; x = -1$

b) $y = -(x+1)^2 + 4$ $x = 1, \; x = -3$

c) $y = (x-5)^2 + 3$ NO Solution

4.) Use the quadratic formula to solve the following:

a) $2y^2 + 3 = -8y$ $a=2, \; b=8, \; c=3$ $\frac{-8 \pm \sqrt{8^2 - 4(2)(3)}}{2(2)} = \frac{-8 \pm \sqrt{40}}{4} = \frac{-8 \pm 6.3}{4}$ $x = -.425$, $x = -3.575$

b) $x^2 + 10x + 9 = 0$ $a=1, \; b=10, \; c=9$ $\frac{-10 \pm \sqrt{10^2 - 4(1)(9)}}{2(1)} = \frac{-10 \pm \sqrt{64}}{2} = \frac{-10 \pm 8}{2}$ $x = -1$, $x = -9$

c) $2x^2 - 5x + 4 = 0$ $a=2, \; b=-5, \; c=4$ $\frac{5 \pm \sqrt{(-5)^2 - 4(2)(4)}}{2(2)} = \frac{5 \pm \sqrt{-7}}{4}$ = no real solutions

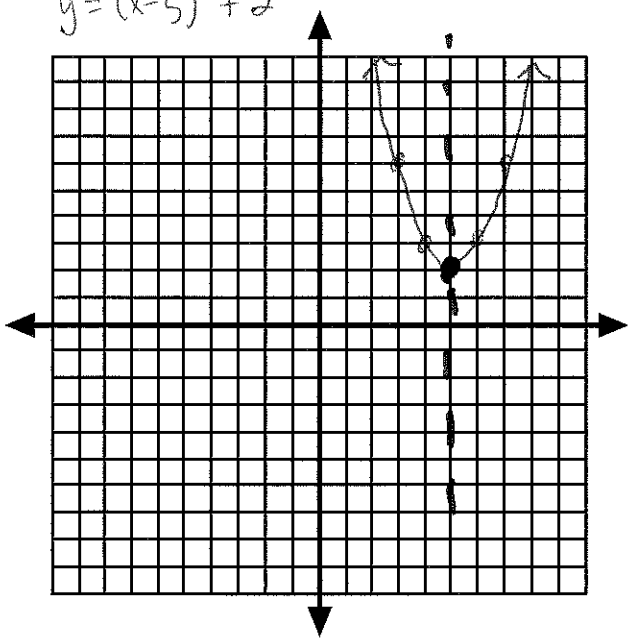
5.) Use completing the square/square root property to solve the following:

a) $x^2 - 6x + 8 = 0$ $-8 \quad -8$ $x^2 - 6x + 9 = 1 \rightarrow \sqrt{(x-3)^2} = \sqrt{1}$ $x - 3 = \pm 1$ $\rightarrow x = 4$, $x = 2$

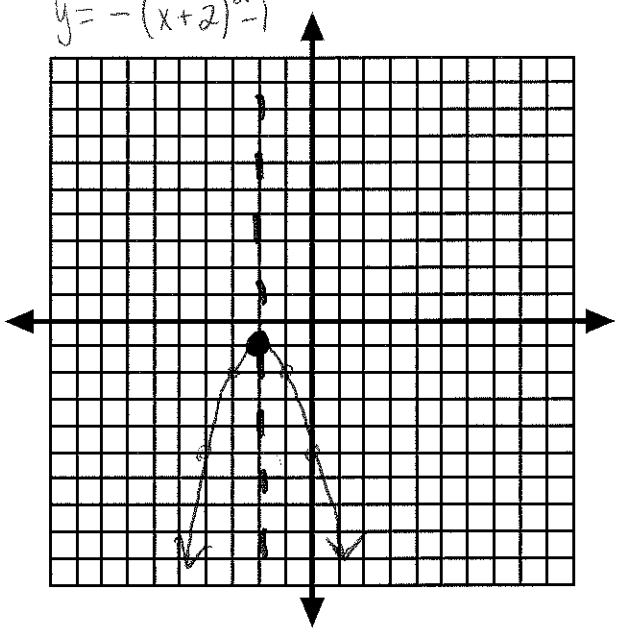
b) $x^2 + 4x - 3 = 0$ $+3 \quad +3$ $x^2 + 4x + 4 = 7 \rightarrow \sqrt{(x+2)^2} = \sqrt{7}$ $x + 2 = \pm 2.6$ $x = .6$, $x = -4.6$

c) $x^2 + 10x + 9 = 0$ $-9 \quad -9$ $x^2 + 10x + 25 = 16$ $\sqrt{(x+5)^2} = \sqrt{16}$ $x + 5 = \pm 4$ $x = -1$, $x = -9$

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



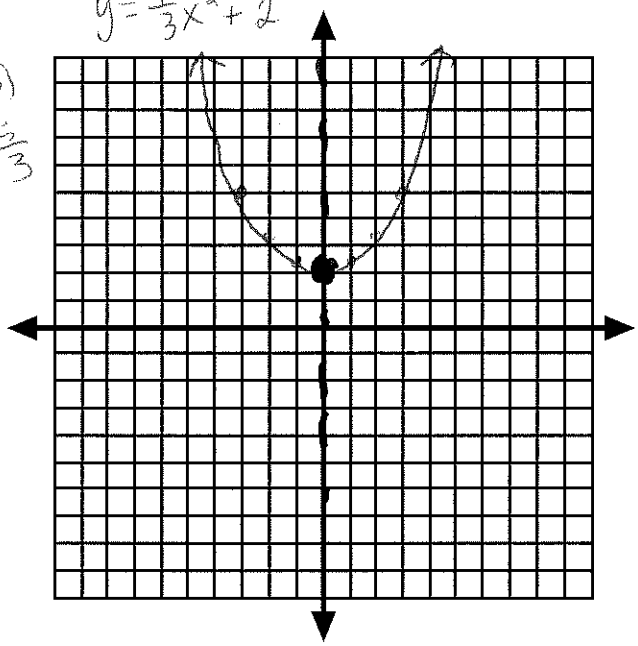
$y = -(x+2)^2 - 1$



$y = \frac{1}{3}x^2 + 2$

$\frac{1}{3}(1, 3, 5)$

$\frac{1}{3}, 1, \frac{5}{3}$



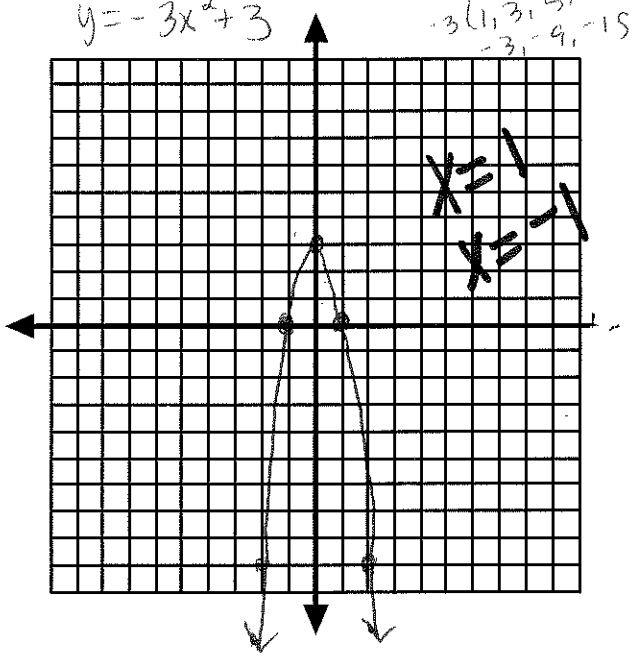
$y = -3x^2 + 3$

$-3(1, 3, 5)$

$-3, -9, -15$

$x = 1$

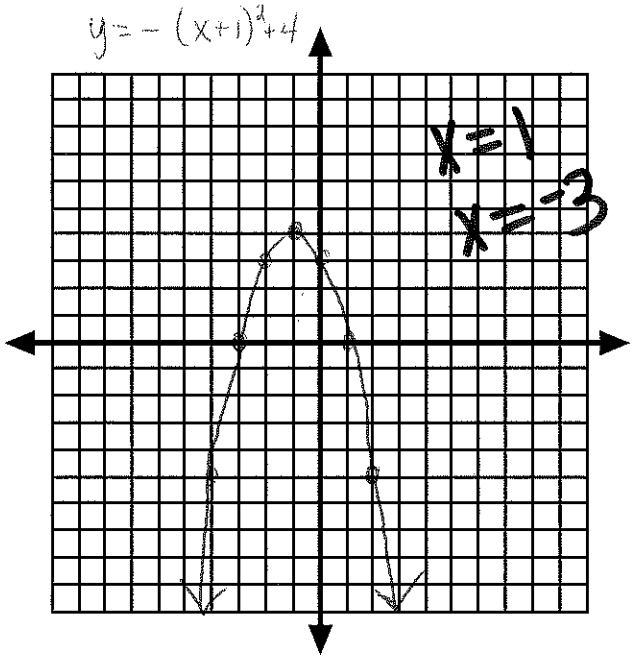
$x = -1$



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

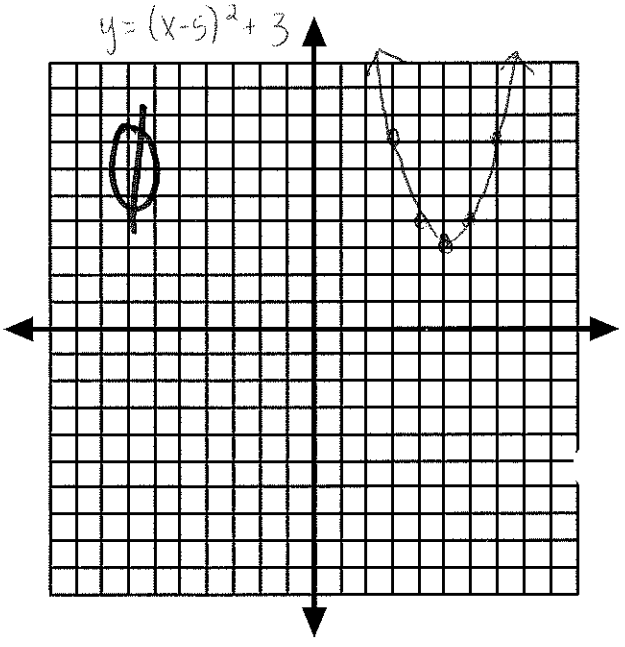
$x = 1$

$x = -3$



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

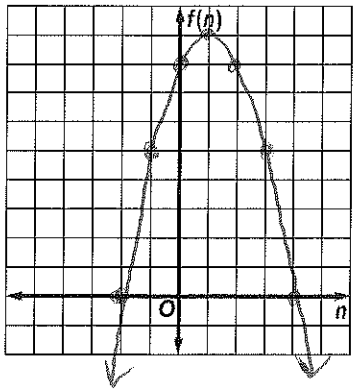
$\emptyset$



Application:

NUMBER THEORY For Exercises 7 and 8, use the following information.

Two numbers have a sum of 2 and a product of −8. The quadratic equation $-n^2 + 2n + 8 = 0$ can be used to determine the two numbers.



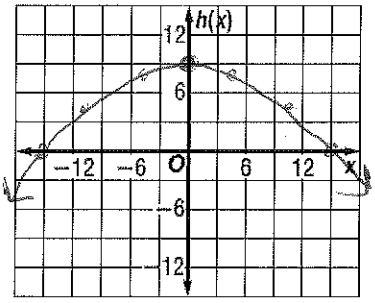
7. Graph the related function $f(n) = -n^2 + 2n + 8$ and determine its x-intercepts.

8. What are the two numbers?

$X = -2$ & $X = 4$

DESIGN For Exercises 9 and 10, use the following information.

A footbridge is suspended from a parabolic support. The function $h(x) = -\frac{1}{25}x^2 + 9$ represents the height in feet of the support above the walkway, where $x = 0$ represents the midpoint of the bridge.



9. Graph the function and determine its x-intercepts. $X = -15$, $X = 15$

10. What is the length of the walkway between the two supports?

30 ft

BUSINESS For Exercises 25 and 26, use the following information.

Jaime owns a business making decorative boxes to store jewelry, mementos, and other valuables. The function $y = x^2 + 50x + 1800$ models the profit y that Jaime has made in month x for the first two years of his business.

25. Write an equation representing the month in which Jaime's profit is $2400.

$2400 = x^2 + 50x + 1800$

$0 = x^2 + 50x - 600$

26. Use completing the square to find out in which month Jaime's profit is $2400.

$625 + 600 = x^2 + 50x + 625$

$\sqrt{1225} = \sqrt{(x+25)^2}$

$\pm 35 = x + 25$

$-25 \quad -25$

$X = 10$ (10 months)

$X = -55$ (no negative)

27. PHYSICS From a height of 256 feet above a lake on a cliff, Mikaela throws a rock out over the lake. The height H of the rock t seconds after Mikaela throws it is represented by the equation $H = -16t^2 + 32t + 256$. To the nearest tenth of a second, how long does it take the rock to reach the lake below? (*Hint:* Replace H with 0.)

$0 = -16t^2 + 32t + 256$

$0 = -16(t^2 - 2t - 16)$

Quad formula

$a = 1 \quad b = -2 \quad c = -16$

$x = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(-16)}}{2(1)}$

$x = \frac{2 \pm \sqrt{68}}{2}$

$X = \frac{2 \pm 8.2}{2}$

$X = 5.1$

$X = -3.1$ no negative

CONSTRUCTION For Exercises 25 and 26, use the following information.

A roofer tosses a piece of roofing tile from a roof onto the ground 30 feet below. He tosses the tile with an initial downward velocity of 10 feet per second.

25. Write an equation to find how long it takes the tile to hit the ground. Use the model for vertical motion, $H = -16t^2 + vt + h$, where H is the height of an object after t seconds, v is the initial velocity, and h is the initial height. (*Hint:* Since the object is thrown down, the initial velocity is negative.)

26. How long does it take the tile to hit the ground?

$H = 0$

$0 = -16t^2 - 10t + 30$

$0 = -2(8t^2 + 5t - 15)$

Quad formula

$a = 8 \quad b = 5 \quad c = -15$

$x = \frac{-5 \pm \sqrt{5^2 - 4(8)(-15)}}{2(8)}$

$x = \frac{-5 \pm \sqrt{505}}{16}$

$x = \frac{-5 \pm 22.5}{16}$

$x = 1.1$

$x = -1.7$

1.1 Seconds

27. PHYSICS Lupe tosses a ball up to Quyen, waiting at a third-story window, with an initial velocity of 30 feet per second. She releases the ball from a height of 6 feet. The equation $h = -16t^2 + 30t + 6$ represents the height h of the ball after t seconds. If the ball must reach a height of 25 feet for Quyen to catch it, does the ball reach Quyen? Explain. (*Hint:* Substitute 25 for h and use the discriminant.)

$25 = -16t^2 + 30t + 6$

$0 = -16t^2 + 30t - 19$

$a = -16$

$b = 30$

$c = -19$

Discriminant

$b^2 - 4ac$

$30^2 - 4(-16)(-19)$

-316

no because the discriminant is negative, therefore there is no solution.