Name Key **Hr** ___ **Math 2A – Practice Test #2 (Ch. 3)**

1. What does it mean to "solve" a quadratic equation? Explain in a few sentences.

find which x-values make the equation true (x-intercepts)

2. What is the difference between a quadratic functions and a linear function? Explain in a few sentences.

quadratic has x^2 (degree 2) linear is just x (degree 1)

3. Decide whether each of the following methods ***always***, ***sometimes***, or ***never*** work for solving quadratic equations.

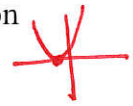
a) Square Root Method sometimes when no x-value

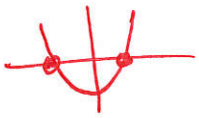
b) Factoring sometimes when you can factor

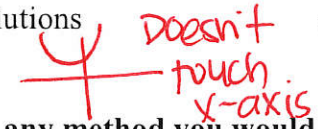
c) Completing the Square

d) Quadratic Formula Always

4. Determine whether each of the following are possibilities for the solution set of a quadratic equation. (Yes/No). If yes, draw a picture to illustrate each solution.

a) Only one solution Yes  touches once

b) Two real solutions Yes  touches twice

c) No real number solutions Yes  Doesn't touch x-axis

d) Three real solutions NO

Solve each equation using any method you would like.

5. $9k^2 + 3k - 6 = 0$

$\frac{9k^2}{3} + \frac{3k}{3} - \frac{6}{3} = \frac{0}{3}$

$3k^2 + k - 2 = 0$ (-6, 3, -2)

$3k^2 + 3k - 2k - 2 = 0$

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

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

$k+1=0$ $3k-2=0$

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

6. $w^2 - 9w = -14$

$w^2 - 9w + 14 = 0$ (14, -7, -2, -9)

$(w-7)(w-2) = 0$

$w-7=0$ $w-2=0$

$w = 7, \; w = 2$

7. $12x^2 - 8 = 16$

$+8 \quad +8$

$\frac{12x^2}{12} = \frac{24}{12}$

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

$x = \pm\sqrt{2}$

8. $3x^2 - 6x = 15$ $a=1$ $b=-2$ $c=-5$ (?, ?, -2)

$\frac{3x^2 - 6x - 15}{3} = 0$ $x^2 - 2x - 5 = 0$

$\frac{2 \pm \sqrt{(-2)^2 - 4(1)(-5)}}{2(1)}$

$\frac{2 \pm \sqrt{24}}{2} = \frac{2 \pm 2\sqrt{6}}{2} = 1 \pm \sqrt{6} = x$

$\sqrt{24} = 2\sqrt{6}$ (4, 2, 2, 3, 2)

9. $2x^2 - 10x = 0$

$2x(x-5) = 0$

$\frac{2x}{2} = \frac{0}{2}$ $x - 5 = 0$

$x = 0 \quad x = 5$

10. $5(x-6)^2 = 50$

$\frac{5(x-6)^2}{5} = \frac{50}{5}$

$\sqrt{(x-6)^2} = \pm\sqrt{10}$

$x - 6 = \pm\sqrt{10}$

$+6 \quad +6$

$x = 6 \pm \sqrt{10}$

11. A ball is thrown into the air. The height h, in feet, of the ball can be modeled by the equation $f(t) = -16t^2 + 20t + 36$, where t is the time, in seconds, the ball is in the air.

a). How high off the ground is the ball after 2 seconds?

$f(2) = -16(2)^2 + 20(2) + 36$

$= 12$ feet

b). When will the ball hit the ground?

$\frac{0}{4} = \frac{-16t^2}{4} + \frac{20t}{4} + \frac{36}{4}$

$0 = -4t^2 + 5t + 9$

$\frac{-5 \pm \sqrt{5^2 - 4(-4)(9)}}{2(-4)}$ $\quad \frac{-5 \pm \sqrt{169}}{-8}$

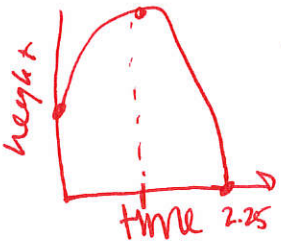
$\frac{-5+13}{-8}$ $\quad \frac{-5-13}{-8}$ $\quad \frac{-18}{-8} = -1 \to 2.25$

2.25 seconds

c) At what height was the ball thrown from?

36 feet $\quad (0, 36)$ y-int

d) When did the ball reach its maximum height? Vertex



$\frac{-20}{2(-16)} = 0.625$ seconds $\quad (h, k)$

e) What is the maximum height?

$f(0.625) = -16(0.625)^2 + 20(0.625) + 36$

$= 42.25$ feet

$\frac{-18}{-8} = \frac{9}{4} = 2.25$

12. Calculate the **average rate of change** of the function $y = 3x^2 + 6x - 8$ on the interval [-2,0]

$\frac{f(0) - f(-2)}{0 + 2} = \frac{-8 + 8}{2} = \frac{0}{2} = 0$

Find a value for c that will make each polynomial a perfect square trinomial.

13. $x^2 + 16x + c$ $\quad 64$ $\quad \left(\frac{16}{2}\right)^2 = 8^2$

$= (x + 8)^2$

14. $x^2 - 4x + c$ $\quad 4$ $\quad \left(\frac{-4}{2}\right)^2 = (-2)^2 = 4$

$(x - 2)^2$

15. Write the general equation of a quadratic in each of the following forms:

Standard Form: $y = ax^2 + bx + c$

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

16. Given $y = x^2 + 2x - 3$, find the following:

a) Factored Form:

$-3 \quad -1$

$3 \quad 2$

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

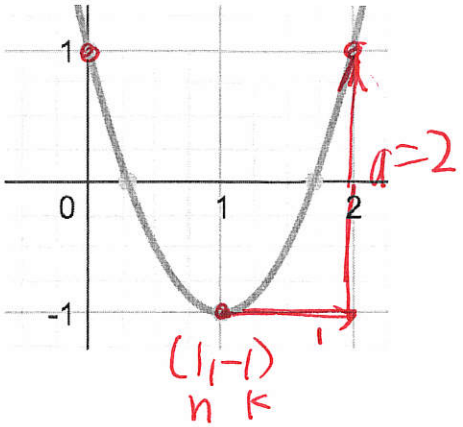
b) Vertex Form: (h, k) $\quad (-1, -4)$ $\quad a = 1$

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

$(-1)^2 + 2(-1) - 3 = 1 - 2 - 3 = -4$

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

17. Write a quadratic equation for the given graph. (**HINT**: Vertex form)



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

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

$= 2x^2 - 4x + 2 - 1$

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

18. Write a quadratic equation with the solutions -5 and $\frac{2}{3}$ in standard form.

$x = -5 \quad x = \frac{2}{3}$

$x + 5 = 0 \quad 3x - 2 = 0$

$(x+5)(3x-2)$

$y = 3x^2 - 2x + 15x - 10$

$y = 3x^2 + 13x - 10$

Simplify, no negative exponents allowed.

19. $\left(2a^{\frac{1}{2}}b\right)^3 (3a^{\frac{3}{4}}b^{\frac{1}{3}})$

$8a^{\frac{3}{2}+\frac{3}{4}}b^{3}$

$= 24a^{\frac{9}{4}}b^{\frac{10}{3}}$

20. $\frac{16x^2y^{\frac{1}{4}}z^{\frac{1}{3}}}{48x^{\frac{3}{4}}y^{\frac{1}{2}}z^{\frac{1}{3}}}$

$\frac{1}{4} - \frac{2}{4} = -\frac{1}{4}$

$\frac{x^{\frac{5}{4}}}{3y^{\frac{1}{4}}}$

21. $\frac{3+\sqrt{45}}{6}$

$\sqrt{45} = 3\sqrt{5}$ (9 · 5; 3 · 3)

$\frac{3+3\sqrt{5}}{6}$

$= \frac{1+\sqrt{5}}{2}$

22. Sketch the graph of $f(t) = -t^2 - 6t - 5$ by using the answers to parts (a-g) below:

a) Axis of Symmetry: $\frac{6}{2(-1)} = \frac{6}{-2} = -3$ $x = -3$

b) Vertex: $(-3, 4)$ $-(-3)^2 - 6(-3) - 5$

$-9 + 18 - 5$

c) Direction of Opening:

Down

d) Minimum or Maximum:

maximum

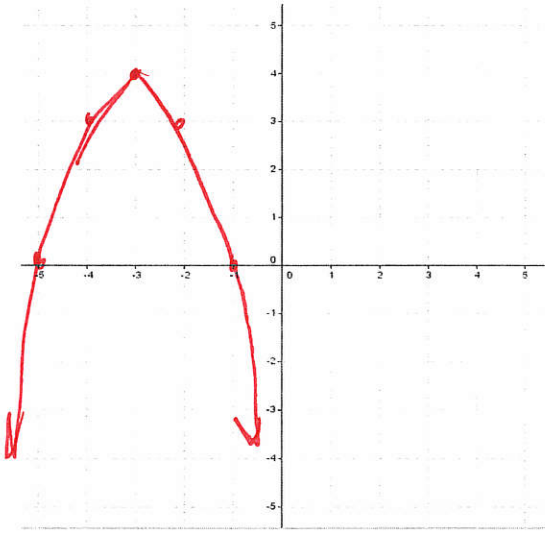
e) y-intercept:

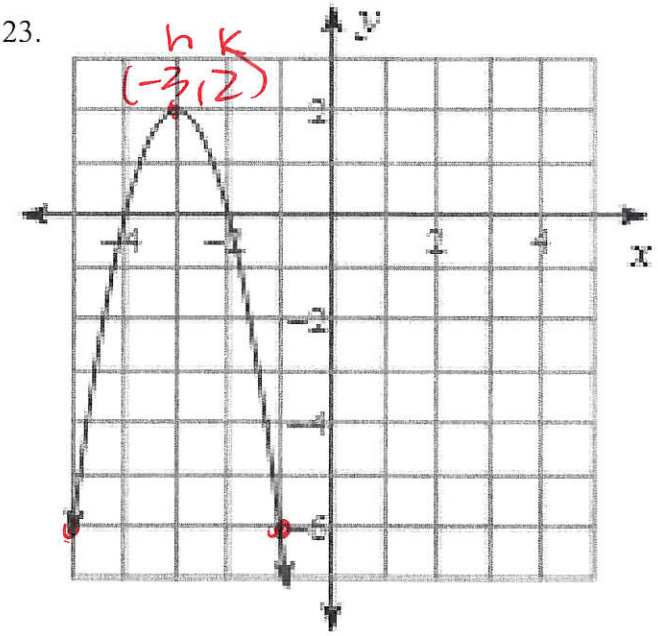
$(0, -5)$

f) x-intercept(s):

$x = -5, \quad x = -1$

$(-5, 0) \quad (-1, 0)$



23. 

a) State the vertex: (-3,2)

b) Find the equation of the parabola: $a=-2$ (h, k) (-3,2)
$y=-2(x+3)^2+2$ or $y=2x^2-12x-16$

c) State the zeros:
$x=-4$ $x=-2$

d) State the y-intercept: (0,-16)
$y=-2(0+3)^2+2$ $-2(9)+2$ $-18+2$ $=-16$

e) State the domain:
$(-\infty,\infty)$

f) State the range:
$(-\infty,2]$

g) Find $f(-1)$ $y=-2(-1+3)^2+2$ (-1,-6)
$-2(4)+2$ $-8+2=-6$

Find vertex form if needed. Then write a verbal expression for each equation describing the transformation from the parent function.

24. $y=-(x-7)^2+3$

right 7, up 3, reflected down (across x-axis)

25. $y=x^2-6x+4$. $\frac{6}{2(1)}=3$ (h, k) (3, -5) $3^2-6(3)+4$

$y=(x-3)^2-5$ right 3, down 5

26. Answer the following questions about the function that has solutions of –2 and 4. $(x+2)(x-4)$
$x=-2$ $x=4$
$+2$ $+2$ -4 -4

Factored form: $y=(x+2)(x-4)$

Standard form: $y=x^2-2x-8$

Vertex form: $y=(x-1)^2-9$ $\frac{2}{2(1)}=1$ $1^2-2(1)-8=-9$

$(h,k)=(1,-9)$

Axis of symmetry: $\frac{-b}{2a}=\frac{2}{2(1)}=1$

$x=1$

Direction of Opening: up

y-intercept: $(0,c)=(0,-8)$

For each of the parabolas, complete the following:

A) Find the other two equivalent forms of each equation: (**Hint:** standard form, vertex form, and factored form.)

B) State or find the vertex

C) Find the y-intercept.

D) Find the x-intercept(s), if any. (**Hint:** try factoring, square root method or the quadratic formula)

E) Graph

27. $y = -(x-2)^2 + 3$ $-(x-2)(x-2)+3$

A) $y = -x^2+4x-1$ $-(x^2-4x+4)+3$ $-x^2+4x-4+3$

B) $(2,3)$

C) $(0,-1)$ $y = -x^2+4x-1$

D) Quadratic formula $a=-1, b=4, c=-1$

$$\frac{-4 \pm \sqrt{4^2-4(-1)(-1)}}{2(-1)} = \frac{-4 \pm \sqrt{12}}{-2}$$

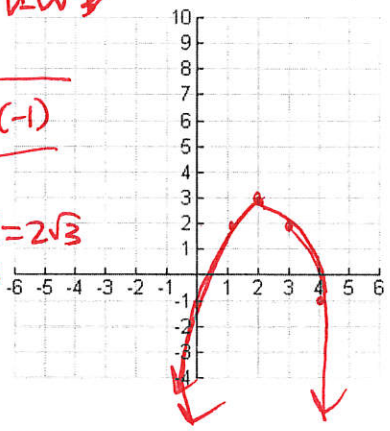
$\sqrt{12} = 2\sqrt{3}$

$$\frac{-4 \pm 2\sqrt{3}}{-2} = 2 \pm \sqrt{3}$$

$(3.73, 0)$ $(.26, 0)$ D

no factored form

E)



28. $y = (x+1)(x-3)$ $y = x^2-2x+1-3$ $+1$

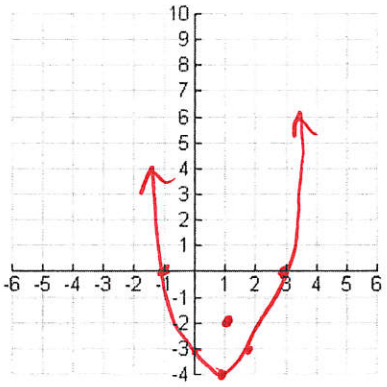
A) $y = x^2-2x-3$ $y = (x-1)^2-4$

B) $(1,-4)$

C) $(0,-3)$

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

E)



29. Write a quadratic equation given the following: Vertex (-1, 1) and a point (2, 4). h k x y

$4 = a(2+1)^2+1$

$4 = 9a+1$

$-1 \quad -1$

$\frac{3}{9} = \frac{9a}{9}$ $a = \frac{1}{3}$

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

30. Given $f(x) = ax^2 + bx + c$. State a value for a that makes $f(x)$ opens down and wider than: $g(x) = 2x^2 + 5x + 3$.

$a = -\frac{1}{2}, -1,$ $-\frac{1}{4}, -\frac{1}{3}, -\frac{2}{3}$, etc...

anything negative and less than 2

Match each equation to its corresponding graph. Then identify KEY Quadratic features that helped you determine each match.

31. C

$y = -2x^2 - 8x - 5$

y-int $(0, -5)$

32. B

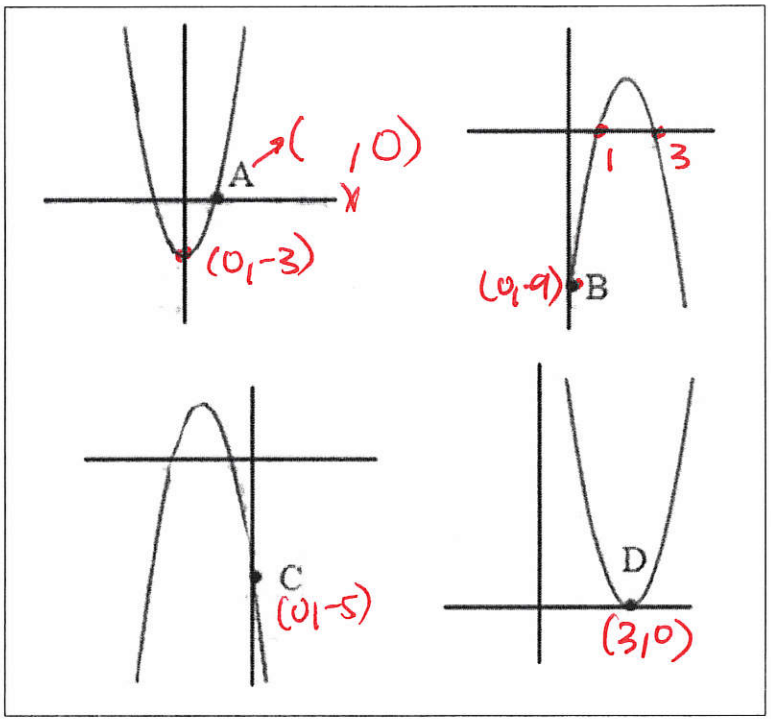
$y = (-3x + 9)(x - 1)$

$x=3 \quad x=1$

$y = -3x^2 + 2x - 9$

y-int $(0, -9)$

x-int $(3, 0)(1, 0)$



33. A

$y = 2x^2 - 3$

up

y-int $(0, -3)$

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

vertex $= (0, -3)$

34. D

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

vertex $(3, 0)$

up

Using the equations and graphs you matched above identify the coordinates for each of the given points.

Use the equations to verify that they are accurate.

35. A $(1.2, 0)$ B $(0, -9)$ C $(0, -5)$ D $(3, 0)$

$0 = 2x^2 - 3$

$+3 \quad +3$

$\frac{3}{2} = \frac{2x^2}{2}$

$\sqrt{\frac{3}{2}} = \sqrt{x^2}$

$x = \pm 1.2$

$y = (0+9)(0-1)$

$y = (9)(-1)$

$y = -9$

$y = -2(0)^2 - 8(0) - 5$

$y = 0 - 5$

$y = -5$

$\frac{0}{3} = \frac{3(x-3)^2}{3}$

$\sqrt{0} = \sqrt{(x-3)^2}$

$0 = x - 3$

$+3 \quad +3$

$3 = x$