Warm Up (2/5/18) PARCC Practice

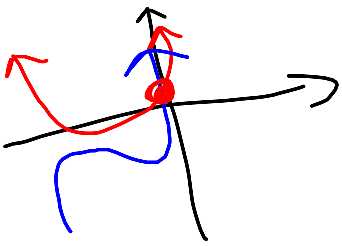
$\boxed{y = x^2 - 2x - 5} \rightarrow$ Quadratic

$\boxed{y = x^3 - 2x^2 - 5x - 9} \rightarrow$ cubic

When the two equations shown are graphed in the coordinate plane, they intersect at a point. What is the *y*-coordinate of the point of intersection?

(Hint: you may need a calculator)

y = ?



y=3 is the y-coordinate of the point of intersection.

x	y
0	
1	
2	
3	
4	
⋮	

x	y
0	
1	
2	
3	
4	
⋮	

In this example you could have approached the problem with a few different strategies.

1.) Factor by grouping - This technique would have required much more insight on how to break apart terms. Possible, but there are many steps required and many more places to make mistakes.

2.) Table of Values - This technique is simpler, but a little tedious. You can create two tables of values, one for each equation, and plug in same values for x in each. Eventually, you will find a common y-value for the same x-value. This will indicate the point of intersection between the two equations.

3.) Graphing Calculator - Plug your equations into a graphing calculator, if it is provided for you. From there you can either look for the point of intersection on the graph or find the point of intersection on the graphing calculator's table of values.

Module 4: Lesson 6

Solving Basic One-Variable Quadratic Equations

Lesson Summary

By looking at the structure of a quadratic equation (missing linear terms, perfect squares, factored expressions), you can find clues for the best method to solve it. Some strategies include setting the equation equal to zero, factoring out the GCF or common factors, and using the zero product property.

Be aware of the domain and range for a function presented in context, and consider whether answers make sense in that context.

Solving Equations Review

Solve the following equations for x.

1. $2x + 3 = 1$

$-3 \quad -3$

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

$\boxed{x = -1}$

2. $2(4x + 7) = 6$

$8x + 14 = 6$

$-14 \quad -14$

$\frac{8x}{8} = \frac{-8}{8}$

$\boxed{x = -1}$

3. $4(x + 4) = 4 - 2x$

$4x + 16 = 4 - 2x$

$+2x \quad +2x$

$6x + 16 = 4$

$-16 \quad -16$

$\frac{6x}{6} = \frac{-12}{6}$

$\boxed{x = -2}$

Linear Equations

- Each equation has 1 solution

↓

Quadratics

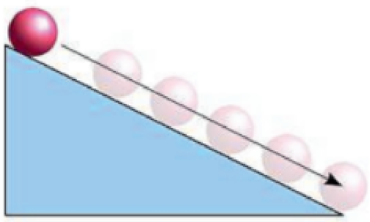
- multiple solutions

Classwork

Example 1

Standard form: $ax^2 + \underline{bx} + c$

A physics teacher put a ball at the top of a ramp and let it roll down toward the floor. The class determined that the height of the ball could be represented by the equation $\boxed{h = -16t^2 + 4}$, where the height, h, is measured in feet from the ground and time, t, is measured in seconds.



a. What do you notice about the structure of the quadratic expression in this problem?

This equation is missing a linear term. (only has 2 terms)

b. In the equation, explain what the 4 represents.

$h = -16t^2 + 4$

4 represents our initial height of the ball. (when time = 0, height = 4 feet)

c. Explain how you would use the equation to determine the time it takes the ball to reach the floor. → height = 0

$h = -16t^2 + 4$

$0 = -16t^2 + 4$

Method 1 (Factor)

$0 = -16t^2 + 4$

$0 = -4(4t^2 - 1)$ Difference of squares

$= -4(2t + 1)(2t - 1)$

$2t + 1 = 0$
$-1 \quad -1$
$\frac{2t}{2} = \frac{-1}{2}$
$t = -\frac{1}{2}$

$2t - 1 = 0$
$+1 \quad +1$
$2t = 1$
$t = \frac{1}{2}$

Method 2

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

$\sqrt{t^2} = \sqrt{\frac{1}{4}} = \frac{\sqrt{1}}{\sqrt{4}} = \frac{1}{2}$

$t = \frac{1}{2}, \quad t = -\frac{1}{2}$

d. Now consider the two solutions for t. Which one is reasonable? Does the final answer make sense based on this context? Explain.

$t = \frac{1}{2}$, $\boxed{\cancel{t = -\frac{1}{2}}}$

$t = \frac{1}{2}$ is a reasonable answer because you can't have $-\frac{1}{2}$ seconds.

Solve each equation. Some of them may have radicals in their solutions. Pg. 35

1. $3x^2 - 9 = 0$

$+9 \quad +9$

$\frac{3x^2}{3} = \frac{9}{3}$

$\sqrt{x^2} = \sqrt{3}$ $\quad \cancel{\sqrt{-3}}$

$x = \sqrt{3} \quad x = -\sqrt{3} \Rightarrow \pm\sqrt{3}$

2. $\sqrt{(x-3)^2} = \sqrt{1}$

$x - 3 = 1$
$+3 \quad +3$
$\boxed{x = 4}$

$x - 3 = -1$
$+3 \quad +3$
$\boxed{x = 2}$

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

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

(+)
$x - 3 = \frac{1}{2}$
$+3 \quad +3$
$\boxed{x = 3.5}$

(−)
$x - 3 = -\frac{1}{2}$
$+3 \quad +3$
$\boxed{x = 2.5}$

4. $\frac{2(x-3)^2}{2} = \frac{12}{2}$

$\sqrt{(x-3)^2} = \sqrt{6}$ $\quad -\sqrt{6}$

$x - 3 = \sqrt{6}$
$+3 \quad +3$
$\boxed{x = \sqrt{6} + 3}$

$x - 3 = -\sqrt{6}$
$+3 \quad +3$
$\boxed{x = -\sqrt{6} + 3}$

Problem Set

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1. Factor completely: $15x^2 - 40x - 15$.

Solve each equation.

2. $4x^2 = 9$
3. $3y^2 - 8 = 13$
4. $(d + 4)^2 = 5$
5. $4(g - 1)^2 + 6 = 13$
6. $12 = -2(5 - k)^2 + 20$

2) $\frac{4x^2}{4} = \frac{9}{4}$

$\sqrt{x^2} = \frac{\sqrt{9}}{\sqrt{4}}$

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

3) $3y^2 - \cancel{8} = 13$

$+\cancel{8}$ $+8$

$\frac{3y^2}{3} = \frac{21}{3}$

$\sqrt{y^2} = \sqrt{7}$

$\boxed{y = \sqrt{7} \quad y = -\sqrt{7}}$

4) $\sqrt{(d+4)^2} = \sqrt{5}$

$d + 4 = \sqrt{5}$

-4 -4

$\boxed{d = -4 + \sqrt{5}}$

$d + 4 = -\sqrt{5}$

-4 -4

$\boxed{d = -4 - \sqrt{5}}$

6) $12 = -2(5-k)^2 + 2\cancel{0}$

-20 -20

$\frac{-8}{-2} = \frac{-2(5-k)^2}{-2}$

$\sqrt{4} = \sqrt{(5-k)^2}$

$2 = 5 - k$

-5 -5

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

$3 = k$

$-2 = 5 - k$

-5 -5

$\frac{-7}{-1} = \frac{-k}{-1}$

$7 = k$