Int. Algebra Review - Solving Quadratics

Key

Name

I. Solve by Factoring

1.) $3x^2 - 2x - 16 = 0$

$(3x - 8)(x + 2) = 0$

$-8x$

$+6x$

$x = \frac{8}{3}$ $x = -2$

2.) $4x^2 - 20x + 25 = 0$ (Perfect Trinomial Square)

$(2x - 5)(2x - 5) = 0$

$x = 5/2$

3.) $x^2 + 3x = 40$

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

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

$x = -8$

$x = 5$

4.) $2x^2 = 15x - 27$

$2x^2 - 15x + 27 = 0$

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

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

5.) $9x^2 - 100 = 0$

$(3x + 10)(3x - 10) = 0$

$x = -10/3$

$x = 10/3$

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

$x(x + 6) = 0$

$x = 0$

$x = -6$

II. Solve by Square Roots. Express your solutions in simplest radical form. You must always use _____ when solving using square roots.

7.) $x^2 = 80$

$x = \pm\sqrt{80}$

$x = \pm\sqrt{4}\sqrt{20}$

$x = \pm 2\sqrt{4}\sqrt{5}$

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

8.) $4x^2 = 81$

$x^2 = \frac{81}{4}$

$x = \pm\frac{9}{2}$

9.) $x^2 + 7 = -300$

$x^2 = -307$

$x = \pm\sqrt{-307}$

no real solution

10.) $(x - 5)^2 = 36$

$x - 5 = \pm\sqrt{36}$

$x - 5 = \pm 6$

$x = 5 \pm 6$

$x = 5 + 6$

$= 11$

$x = 5 - 6$

$= -1$

11. $5(x + 2)^2 - 4 = 36$

III. Solve by using the **quadratic formula**.

The quadratic formula is: $x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

Given $0 = ax^2 + bx + c$.

12. $x^2 + 3x + 5 = 0$

$a = 1$

$b = 3$

$c = 5$

$b^2-4ac = 9 - 4(1)(5)$

$= -11$

$\sqrt{b^2-4ac} = \sqrt{-11}$

no real solution

13. $4x^2 - 8x = 1$

$4x^2 - 8x - 1 = 0$

$a = 4$

$b = -8$

$c = -1$

b^2-4ac

$= (-8)^2 - 4(4)(-1)$

$= 64 + 16$

$= 80$

$\sqrt{b^2-4ac} = \sqrt{80} = \sqrt{4}\sqrt{20}$

$= 2\sqrt{20}$

$= 2 \cdot 2\sqrt{5} = 4\sqrt{5}$

14. $x^2 + 8x = 8$

$x^2 + 8x - 8 = 0$

$a = 1 \quad b = 8 \quad c = -8$

$b^2-4ac = (8)^2 - 4(1)(-8)$

$= 64 + 32 = 96$

$\sqrt{b^2-4ac} = \sqrt{96} = \sqrt{16}\sqrt{6}$

$= 4\sqrt{6}$

$x = \dfrac{-8 \pm 4\sqrt{6}}{2} = \dfrac{-4 \pm 2\sqrt{6}}{1}$

$x = \dfrac{8 \pm 4\sqrt{5}}{8}$

$x = \dfrac{2 \pm \sqrt{5}}{2}$

15) What are the **two mistakes** in setting up the quadratic formula? Find them and fix them!

Solve: $2x^2 - x - 6 = 0$

$x = \dfrac{-1 \pm \sqrt{(-1)^2 - 4(2)(6)}}{2(2)}$ ← should be -6

$a = 2$

$b = -1$

$c = -6$

should be. The opp. of -1 which is 1.

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

$x = \dfrac{1 \pm \sqrt{1 + 48}}{4}$

$x = \dfrac{1 \pm \sqrt{49}}{4}$

$x = \dfrac{1 \pm 7}{4}$

$\dfrac{1+7}{4} = \dfrac{8}{4} = 2$

$\dfrac{1-7}{4} = \dfrac{-6}{4} = \dfrac{-3}{2}$

IV. REVIEW – PROJECTILE MOTION PROBLEMS

Projectile Motion Formula: $h(t) = -16t^2 + V_0t + h_0$

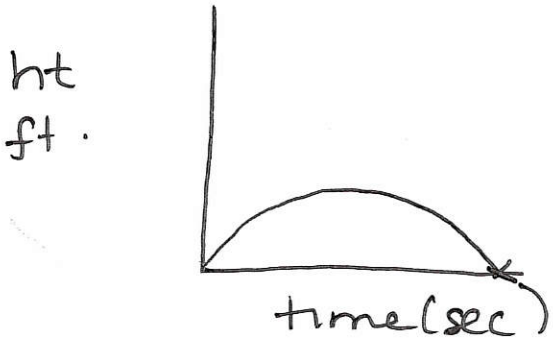
where: $h(t)$ is ending height after t seconds, V_0 = initial velocity, h_0 = initial height.

GROUND means that the ending height after t seconds is 0.

1. Julia kicks soccer ball from the ground with an initial velocity of 32 feet per second.

A. Write the equation that represents this situation. $h(t) = -16t^2 + 32t + 0$

B. Sketch and label the graph that represents this problem.



C. How many seconds will it take for the ball to hit the ground? Ground → set $h(t) = 0$.

$$\frac{0}{-16} = \frac{-16t^2}{-16} + \frac{32t}{-16}$$

$0 = t^2 - 2t$ USE GCF

$t(t-2) = 0$

$t = 0 \quad t - 2 = 0$

$t = 2$

2 secs.

D. How high will the ball be after 1 second?

16 ft.

$h(1) = -16(1)^2 + 32(1)$

$t = 16$ ft.

E. WHEN will the ball reach its maximum height? (Either use the roots or the formula t = -b/2a)

$$t = \frac{-b}{2a} = \frac{-32}{2(-16)} = 1 \text{ second.}$$

F. What is the maximum height that the ball reaches?

Sub in t max for time:

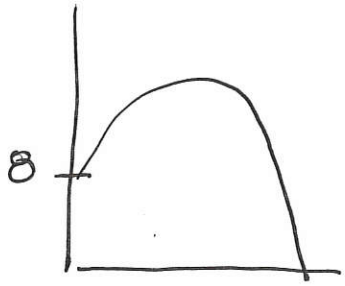
$h(1) = -16(1)^2 + 32(1)$

$= 16$ ft.

2. Ray launches a rocket from a point 8 feet above the water with an initial upward velocity of 16 feet per second.

A. Write the equation that represents the problem. $h(t) = -16t^2 + 16t + 8$

B. Sketch and label a graph to represent the problem.



C. How long will it take the rocket to reach the water?

$h(t) = 0$

$0 = -16t^2 + 16t + 8$

$\frac{0}{-8} = \frac{-16t^2}{-8} + \frac{16t}{-8} + \frac{8}{-8}$

$0 = 2t^2 - 2t - 1$

It doesn't factor! ∴

Use QF

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

$b^2 - 4ac$

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

$= 4 + 8 = 12$

$\sqrt{b^2-4ac} = \sqrt{12} = 2\sqrt{3}$

$x = \frac{2 \pm 2\sqrt{3}}{4} = \frac{1 \pm \sqrt{3}}{2}$

D. How high will the rocket be after 1 second?

$h(1) = -16(1)^2 + 16(1) + 8$

$-16 + 16 + 8 = 8$ feet.

The equation t = -b/2a can be used to find when the rocket will reach its maximum height.

Use it to find when the rocket will reach its max height.

$t = \frac{-b}{2a} = \frac{-16}{-32} = \frac{1}{2}$

E. What will its maximum height be?

Sub in $\frac{1}{2}$ for t

$h\left(\frac{1}{2}\right) = -16\left(\frac{1}{2}\right)^2 + 16\left(\frac{1}{2}\right) + 8$

$= -4 + 8 + 8 =$ 12 feet.

Name:_____ Block:_____ Integrated Algebra

Solving Quadratics REVIEW

I. Zero Product Property:

If the product of two quantities equals zero, at least one of the quantities equals zero.

If ab = 0, then a = 0 or b = 0.

1.Use the Zero Product Property to solve the equation. Check your answers.

1. $(x-3)(x+7)=0$

$x-3=0 \quad x+7=0$

$x=3 \quad x=-7$

2. $x(x-5)=0$

$x=0 \quad x-5=0$

$x=5$

3. $(3x+2)(4x-1)=0$

$3x+2=0 \quad 4x-1=0$

$x=-2/3 \quad x=1/4$

4. $2(4x-2)(2x+4)=0$

$4x-2=0 \quad 2x+4=0$

$4x=2 \quad 2x=-4$

$x=\frac{2}{4} \quad x=-2$

$x=\frac{1}{2}$

II.. Solve by Factoring

Objective: ***I CAN . . .*** solve quadratic equations by **factoring.**

Factor. Don't forget to check to see if there is a GCF first!

5. $x^2+10x+16$

$(x-8)(x-2)=0$

$x-8=0 \quad x-2=0$

$x=8 \quad x=2$

6. x^3+2x^2-24x

$x(x^2+2x-24)$

$x(x+6)(x-4)$

7. $36x^2-49$

$(6x+7)(6x-7)$.

III. Solve each by factoring and then using the zero product property. Always check for a GCF first!

1. $4x^2+21x+5=0$

$(4x+1)(x+5)=0$

$4x+1=0 \qquad x+5=0$

$4x=-1 \qquad x=-5$

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

2. $x^2-8x+12=0$

$(x-6)(x-2)=0$

$x=6 \qquad x=2$

3. $3t^2-6t=30$ **(GCF!)**

$3t^2-6t-30=0$

$3(t^2-2t-10)=0$

~~3~~ t can't factor

4. $d^3+d^2-20d=0$ **(GCF)**

$d(d^2+d-20)=0$

$d(d+5)(d-4)=0$

$d=0 \qquad d=0$

$d+5=0 \qquad d=-5$

$d-4=0 \qquad d=4$

5. $25x^2-16=0$

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

$5x+4=0 \qquad 5x-4=0$

$x=\frac{-4}{5} \qquad x=\frac{4}{5}$

6. $25x^2=20x-4$

$25x^2-20x+4=0$

$(5x-2)(5x-2)=0$

$5x-2=0 \qquad 5x-2=0$

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

7. $4x^2-8x+3=0$

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

$2x-1=0 \qquad 2x-3=0$

$2x=1 \qquad 2x=3$

$x=\frac{1}{2} \qquad x=\frac{3}{2}$

IV. Solving with Square Roots

Objective: ***I CAN . . .*** solve quadratic equations by using **square roots**.

Simplify completely.

1. $\sqrt{16}$ $= 4$

2. $\sqrt{28} = \sqrt{4}\sqrt{7}$
$= 2\sqrt{7}$

3. $\sqrt{75}$
$= \sqrt{25}\sqrt{3}$
$= 5\sqrt{3}$

4. $2\sqrt{60}$
$2\sqrt{4}\sqrt{15}$
$4\sqrt{15}$

5. $\frac{1}{3}\sqrt{9}$
$\frac{1}{3} \cdot 3 = 1$

6. $\frac{1}{8}\sqrt{20}$
$\frac{1}{8} \cdot \sqrt{4} \cdot \sqrt{5}$
$\frac{1}{8} \cdot 2\sqrt{5}$
$\frac{2\sqrt{5}}{8} = \frac{\sqrt{5}}{4}$

Solve for x.

1. $x^2 = 25$ $x = \pm 5$

> *If $x^2 = a$ and a is a positive real number then $x = \pm\sqrt{a}$*

Solve using square roots.

1. $2x^2 = 16$
$x^2 = 8$
$x = \pm\sqrt{8}$
$x = \pm\sqrt{4}\sqrt{2}$
$x = \pm 2\sqrt{2}$

2. $x^2 = -4$
$x = \pm\sqrt{-4}$
no real solutions.

3. $3x^2 - 81 = 0$
$3x^2 = 81$
$x^2 = 27$
$x = \pm\sqrt{27}$
$x = \pm\sqrt{9}\sqrt{3}$
$x = \pm 3\sqrt{3}$

4. $(x+2)^2 = 9$
$x + 2 = \pm\sqrt{9}$
$x = -2 \pm \sqrt{9}$
$x = -2 \pm 3$
$-2 + 3 = 1$
$-2 - 3 = -5$

5. $3(x-2)^2 - 7 = 23$
$+7 \quad +7$
$\frac{3(x-2)^2}{3} = \frac{30}{3}$
$(x-2)^2 = 10$
$x - 2 = \pm\sqrt{10}$
$x = 2 \pm \sqrt{10}$

V. Quadratic Formula

Objective: ***I CAN . . .*** solve by using the **Quadratic Formula**.

The Quadratic Formula:

The solutions of $ax^2+bx+c=0$ where $a\neq 0$ are $x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$

The **discriminant** of the quadratic equation is b^2-4ac.

Solve using the Quadratic Formula.

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

$a=2 \quad b=-2 \quad c=-3$

$b^2-4ac=(-2)^2-4(2)(-3)$

$=4+24$

$=28$

$\sqrt{b^2-4ac}=\sqrt{28}=\sqrt{4}\sqrt{7}=2\sqrt{7}$

$x=\dfrac{-b\pm 2\sqrt{7}}{4}=\dfrac{2\pm 2\sqrt{7}}{4}$

$=\dfrac{1\pm\sqrt{7}}{2}$

2. $2x^2+3x+5=0$

$a=2 \quad b=3 \quad c=5$

$b^2-4ac=$

$(3)^2-4(2)(5)$

$9-40=-31$

$\sqrt{-31}\rightarrow$ no real solution.

3. $x^2-2x=4$

$x^2-2x-4=0$

$a=1$

$b=-2$

$c=-4$

$b^2-4ac=(-2)^2-4(1)(-4)$

$=4+16=20$

$x=\dfrac{2\pm\sqrt{20}}{2}=\dfrac{2\pm 2\sqrt{5}}{2}=1\pm\sqrt{5}$

4. $2x^2=8x-1$

$2x^2-8x+1=0$

$a=2$

$b=-8$

$c=1$

$b^2-4ac=(-8)^2-4(2)(1)$

$=64-8$

$b^2-4ac=56$

$\sqrt{b^2-4ac}=\sqrt{56}$

$=\sqrt{4}\sqrt{14}$

$=2\sqrt{14}$

$\pm\sqrt{5}/2$

So $x=\dfrac{8\pm 2\sqrt{14}}{4}=$