Name Mr. Ward Date _____ Class _____

LESSON 9-9

Review for Mastery

The Quadratic Formula and the Discriminant

The Quadratic Formula can be used to solve any quadratic equation.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Solve $2x^2 - 5x - 12 = 0$ using the quadratic formula.

$$2x^2 - 5x - 12 = 0$$

Step 1: Identify *a*, *b*, and *c*.

$a = 2$

$b = -5$

$c = -12$

Step 2: Substitute into the quadratic formula.

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-12)}}{2(2)}$$

Step 3: Simplify.

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-12)}}{2(2)}$$

$$x = \frac{5 \pm \sqrt{25 - (-96)}}{4}$$

$$x = \frac{5 \pm \sqrt{121}}{4}$$

$$x = \frac{5 \pm 11}{4}$$

Step 4: Write two equations and solve.

$$x = \frac{5 + 11}{4} \quad \text{or} \quad x = \frac{5 - 11}{4}$$

$$x = 4 \quad \text{or} \quad x = -\frac{3}{2}$$

Solve using the quadratic equation by filling in the blanks below.

1. $x^2 + 2x - 35 = 0$

$a =$ 1 ; $b =$ 2 ; $c =$ -35

$$x = \frac{-(\boxed{2}) \pm \sqrt{(\boxed{2})^2 - 4(\boxed{1})(\boxed{-35})}}{2\boxed{1}}$$

Simplify: $\frac{-2 \pm \sqrt{144}}{2} \rightarrow \frac{-2 \pm 12}{2}$ ↗ $x = 5$ ↘ $x = -7$

2. $3x^2 + 7x + 2 = 0$

$a =$ 3 ; $b =$ 7 ; $c =$ 2

$$x = \frac{-(\boxed{7}) \pm \sqrt{(\boxed{7})^2 - 4(\boxed{3})(\boxed{2})}}{2\boxed{3}}$$

Simplify: $\frac{-7 \pm \sqrt{25}}{6} \rightarrow \frac{-7 \pm 5}{6}$ ↗ $x = -1/3$ ↘ $x = -2$

3. $x^2 + x - 20 = 0$

$a =$ 1 ; $b =$ 1 ; $c =$ -20

$$x = \frac{-(\boxed{1}) \pm \sqrt{(\boxed{1})^2 - 4(\boxed{1})(\boxed{-20})}}{2\boxed{1}}$$

Simplify: $\frac{-1 \pm \sqrt{81}}{2} \rightarrow \frac{-1 \pm 9}{2}$ ↗ $x = -5$ ↘ $x = 4$

4. $2x^2 - 9x - 5 = 0$

$a =$ 2 ; $b =$ -9 ; $c =$ -5

$$x = \frac{-(\boxed{-9}) \pm \sqrt{(\boxed{-9})^2 - 4(\boxed{2})(\boxed{-5})}}{2\boxed{2}}$$

Simplify: $\frac{9 \pm \sqrt{121}}{4} \rightarrow \frac{9 \pm 11}{4}$ ↗ $x = 5$ ↘ $x = -1/2$

Name _____ Date _____ Class _____

LESSON 9-9

Review for Mastery

The Quadratic Formula and the Discriminant *continued*

The discriminant of a quadratic equation is $b^2 - 4ac$. The discriminant will indicate the number of real solutions in a quadratic equation.

If $b^2 - 4ac > 0$	the equation has 2 real solutions.
If $b^2 - 4ac = 0$	the equation has 1 real solution.
If $b^2 - 4ac < 0$	the equation has 0 real solutions.

Find the number of real solutions of $4x^2 - 8x + 5 = 0$ using the discriminant.

$4x^2 - 8x + 5 = 0$

Step 1: Identify a, b, and c.

$a = 4$, $b = -8$, $c = 5$

Step 2: Substitute into $b^2 - 4ac$.

$(-8)^2 - 4(4)(5)$

Step 3: Simplify.

$64 - 80 = -16$

$b^2 - 4ac$ is negative.
There are no real solutions.

Find the number of real solutions of $9x^2 - 49 = 0$ using the discriminant.

$9x^2 - 49 = 0$

Step 1: Identify a, b, and c.

$a = \cancel{4}\ 9$, $b = 0$, $c = -49$

Step 2: Substitute into $b^2 - 4ac$.

$(0)^2 - 4(9)(-49)$

Step 3: Simplify.

$0 + 1764 = 1764$

$b^2 - 4ac$ is positive.
There are two real solutions.

Find the number of real solutions of each equation using the discriminant by filling in the boxes below.

5. $4x^2 + 20x + 25 = 0$

$a = \boxed{4}$; $b = \boxed{20}$; $c = \boxed{25}$

$(\boxed{20})^2 - 4(\boxed{4})(\boxed{25}) = 0$

1 real solution

6. $15x^2 + 8x + -1 = 0$

$a = \boxed{15}$; $b = \boxed{8}$; $c = \boxed{-1}$

$(\boxed{8})^2 - 4(\boxed{15})(\boxed{-1}) = 124$

2 real solutions

Find the number of real solutions of each equation using the discriminant.

7. $x^2 + 9x - 36 = 0$ $a = 1$ $b = 9$ $c = -36$

$81 - 4(1)(-36) = 225$

2 real solutions

8. $25x^2 + 4 = 0$ $a = 25$ $b = 0$ $c = 4$

$(0)^2 - 4(25)(4) = -400$

0 real solutions

Name _____ Date _____ Class _____

LESSON 9-9

Practice A

The Quadratic Formula and the Discriminant

Solve using the quadratic formula.

1. $x^2 + 6x + 5 = 0$

a: $\boxed{1}$ b: $\boxed{6}$ c: $\boxed{5}$

$$x = \frac{-\boxed{6} \pm \sqrt{\boxed{6}^2 - 4\boxed{1}\boxed{5}}}{2\boxed{1}}$$

$\frac{-6 \pm \sqrt{16}}{2} \rightarrow \frac{-6 \pm 4}{2}$ ↗ $x = -5$ ↘ $x = -1$

2. $x^2 - 9x + 20 = 0$

a: $\boxed{1}$ b: $\boxed{-9}$ c: $\boxed{20}$

$$x = \frac{-\boxed{-9} \pm \sqrt{\boxed{-9}^2 - 4\boxed{1}\boxed{20}}}{2\boxed{1}}$$

$\frac{9 \pm \sqrt{1}}{2} \rightarrow \frac{9 \pm 1}{2}$ ↗ $x = 5$ ↘ $x = 4$

3. $2x^2 + 9x + 4 = 0$

a: $\boxed{2}$ b: $\boxed{9}$ c: $\boxed{4}$ $\frac{-9 \pm \sqrt{(9)^2 - 4(2)(4)}}{2(2)}$

$\frac{-9 \pm \sqrt{49}}{4} \rightarrow \frac{-9 \pm 7}{4}$ ↗ $x = -4$ ↘ $x = -1/2$

4. $x^2 - 3x - 18 = 0$

a: $\boxed{1}$ b: $\boxed{-3}$ c: $\boxed{-18}$ $\frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-18)}}{2(1)}$

$\frac{3 \pm \sqrt{81}}{2} \rightarrow \frac{3 \pm 9}{2}$ ↗ $x = 6$ ↘ $x = -3$

Find the number of real solutions of each equation using the discriminant.

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

$b^2 - 4ac = \boxed{3}^2 - 4\boxed{1}\boxed{5}$

$= -11$

0 real solutions

6. $x^2 + 10x + 25 = 0$

$b^2 - 4ac = \boxed{10}^2 - 4\boxed{1}\boxed{25}$

$= 0$

1 real solution

7. $x^2 - 6x - 7 = 0$

$b^2 - 4ac = (-6)^2 - 4(1)(-7)$

$= 64$

2 real solutions

Solve using any method.

8. $x^2 - 64 = 0$ $\sqrt{x^2} = \sqrt{64}$

$x = \pm 8$

9. $x^2 + 12x + 36 = 0$

$(x+6)(x+6) = 0$

$x = -6$

10. $x^2 + 4x - 32 = 0$

$(x+8)(x-4) = 0$

$x = -8 \quad x = 4$

11. $2x^2 + 9x - 5 = 0$ $\frac{-9 \pm \sqrt{(9)^2 - 4(2)(-5)}}{2(2)}$

$\frac{-9 \pm \sqrt{121}}{4} \rightarrow \frac{-9 \pm 11}{4}$ ↗ $x = 1/2$ ↘ $x = -5$

Name _____ Date _____ Class _____

LESSON 9-9

Practice B

The Quadratic Formula and the Discriminant

Solve using the quadratic formula.

1. $x^2 + x = 12$

$x^2 + x - 12 = 0$

$a = 1 \quad b = 1 \quad c = -12$

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

$\frac{-1 \pm \sqrt{49}}{2} \rightarrow \frac{-1 \pm 7}{2}$ → $x = -4$, $x = 3$

2. $4x^2 - 17x - 15 = 0$

$a = 4 \quad b = -17 \quad c = -15$

$\frac{-(-17) \pm \sqrt{(-17)^2 - 4(4)(-15)}}{2(4)}$

$\frac{17 \pm \sqrt{529}}{8} \rightarrow \frac{17 \pm 23}{8}$ → $x = 5$, $x = -3/4$

3. $2x^2 - 5x = 3$

$2x^2 - 5x - 3 = 0$

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

$\frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-3)}}{2(2)}$

$\frac{+5 \pm \sqrt{49}}{4} \rightarrow \frac{5 \pm 7}{4}$ → $x = 3$, $x = -1/2$

4. $3x^2 + 14x - 5 = 0$

$a = 3 \quad b = 14 \quad c = -5$

$\frac{-14 \pm \sqrt{(14)^2 - 4(3)(-5)}}{2(3)}$

$\frac{-14 \pm \sqrt{256}}{6} \rightarrow \frac{-14 \pm 16}{6}$ → $x = 1/3$, $x = -5$

Find the number of real solutions of each equation using the discriminant.

5. $x^2 + 25 = 0$

$a = 1 \quad b = 0 \quad c = 25$

$(0)^2 - 4(1)(25) = -100$

0 real solutions

6. $x^2 - 11x + 28 = 0$

$a = 1 \quad b = -11 \quad c = 28$

$(-11)^2 - 4(1)(28) = 9$

2 real solutions

7. $x^2 + 8x + 16 = 0$

$a = 1 \quad b = 8 \quad c = 16$

$(8)^2 - 4(1)(16) = 0$

1 real solution

Solve using any method.

8. $x^2 + 8x + 15 = 0$

$(x+5)(x+3) = 0$

$x = -5 \quad x = -3$

9. $x^2 - 49 = 0$

$\sqrt{x^2} = \sqrt{49}$

$x = \pm 7$

10. $6x^2 + x - 1 = 0$

$a = 6 \quad b = 1 \quad c = -1$

$\frac{-1 \pm \sqrt{(1)^2 - 4(6)(-1)}}{2(6)}$

$\frac{-1 \pm \sqrt{25}}{12} \rightarrow \frac{-1 \pm 5}{12}$ → $x = -1/2$, $x = 1/3$

11. $x^2 + 8x - 20 = 0$

$(x+10)(x-2) = 0$

$x = -10 \quad x = 2$

12. In the past, professional baseball was played at the Astrodome in Houston, Texas. The Astrodome has a maximum height of 63.4 m. The height of a baseball t seconds after it is hit straight up in the air with a velocity of 45 ft/s is given by $h = -9.8t^2 + 45t + 1$. Will a baseball hit straight up with this velocity hit the roof of the Astrodome? Use the discriminant to explain your answer.