Chapter Five Review Key
RK – AA – U1C5

Name____ Period________________

1. Solving the quadratic equation by using any method: $3x^2 + 8x - 3 = 0$.

1. $x = \frac{1}{3}, x = -3$

Done with factoring:

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

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

$3x=1 \quad x=-3$

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

2. Solving the quadratic equation by using any method: $-4x^2 = 35$

2. $x = -\frac{i\sqrt{35}}{2}, x = \frac{i\sqrt{35}}{2}$

Done with square roots:

$-4x^2 = 35$

$x^2 = \frac{-35}{4} \rightarrow x = \pm\sqrt{\frac{-35}{4}} = \pm\frac{\sqrt{-35}}{\sqrt{4}} = \pm\frac{\sqrt{-1}\bullet\sqrt{35}}{2} = \pm\frac{i\sqrt{35}}{2}$

3. Solving the quadratic equation by using any method: $4(x-2)^2 = -8$

3. $x = 2 - i\sqrt{2}, x = 2 + i\sqrt{2}$

Done with square roots:

$4(x-2)^2 = -8 \rightarrow (x-2)^2 = -2 \rightarrow x-2 = \pm\sqrt{-2} \rightarrow x-2 = \pm\sqrt{-1}\bullet\sqrt{2} \rightarrow x-2 = \pm i\sqrt{2}$

$\rightarrow x = 2 \pm i\sqrt{2}$

4. Solving the quadratic equation by using any method: $x^2 + 2x - 2 = 0$

4. $x = -1-\sqrt{3}, x = -1+\sqrt{3}$

Done with completing the square:

$x^2 + 2x = 2 \rightarrow x^2 + 2x + \left(\frac{2}{2}\right)^2 = 2 + \left(\frac{2}{2}\right)^2 \rightarrow x^2 + 2x + 1 = 2 + 1 \rightarrow (x+1)^2 = 3 \rightarrow x+1 = \pm\sqrt{3}$

$\rightarrow x = -1 \pm \sqrt{3}$

5. Solving the quadratic equation by using any method: $3x^2 - 14x = -49$

5. $x = \frac{7}{3} - \frac{7i\sqrt{2}}{3}, x = \frac{7}{3} + \frac{7i\sqrt{2}}{3}$

Done with the quadratic formula:

$3x^2 - 14x + 49 = 0 \quad a = 3 \quad b = -14 \quad c = 49$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-14) \pm \sqrt{(-14)^2 - 4(3)(49)}}{2(3)} = \frac{14 \pm \sqrt{196 - 588}}{6} = \frac{14 \pm \sqrt{-392}}{6} = \frac{14 \pm \sqrt{196}\bullet\sqrt{-1}\bullet\sqrt{2}}{6}$

$= \frac{14 \pm 14i\sqrt{2}}{6} = \frac{14}{6} \pm \frac{14i\sqrt{2}}{6} = \frac{7}{3} \pm \frac{7i\sqrt{2}}{3}$

6. Solving the quadratic equation by using any method: $(x-2)^2 + 64 = 0$

6. $x = 2 - 8i, x = 2 + 8i$

Done with square roots:

$(x-2)^2 = -64 \rightarrow x - 2 = \pm\sqrt{-64} \rightarrow x - 2 = \pm\sqrt{64} \bullet \sqrt{-1} \rightarrow x - 2 = \pm 8i \rightarrow x = 2 \pm 8i$

7. Write the following expression as a complex number in standard form: $(7 + 2i) - (3 + 3i)$

7. $4 - i$

$7 + 2i - 3 - 3i = 7 - 3 + 2i - 3i = 4 - i$

8. Write the following expression as a complex number in standard form: $(5 + 3i)(2 - 4i)$

8. $22 - 14i$

$(5+3i)(2-4i) = 10 - 20i + 6i - 12i^2 = 10 - 14i - 12i^2 = 10 - 14i - 12(-1) = 10 - 14i + 12 = 22 - 14i$

9. Write the following expression as a complex number in standard form: $\frac{3-i}{2+i}$

9. $1 - i$

$$\frac{3-i}{2+i} \bullet \frac{2-i}{2-i} = \frac{(3-i)(2-i)}{(2+i)(2-i)} = \frac{6 - 3i - 2i + i^2}{4 - 2i + 2i - i^2} = \frac{6 - 5i + i^2}{4 - i^2} = \frac{6 - 5i + (-1)}{4 - (-1)} = \frac{5 - 5i}{5} = 1 - i$$

10. Factor the following expression completely: $10x^2 - 3x - 1$

10. $(5x+1)(2x-1)$

11. Factor the following expression completely: $9x^2 - 121$

11. $(3x+11)(3x-11)$

12. Factor the following expression completely: $6x^2 + 17x + 5$

12. $(3x+1)(2x+5)$

13. Factor the following expression completely: $2x^2 - x - 21$

13. $(2x-7)(x+3)$

14. Factor the following expression completely: $5x^2 + 3x - 2$

14. $(5x-2)(x+1)$

15. Factor the following expression completely: $3x^2 + 8x - 3$

15. $(3x-1)(x+3)$

16. A model for Healey Construction's revenue is $R = -15p^2 + 300p + 12000$, where p is the price in dollars of the company's product. What price will maximize the revenue? What will be the maximum revenue?

16. Price: $10

Maximum revenue: $13,500

Since the graph of this function would face down (because of the negative), the vertex would be the maximum, where p is the maximum price in dollars and R is the maximum revenue.

$$p = -\frac{b}{2a} = -\frac{300}{2(-15)} = -\frac{300}{-30} = 10 = \$10$$

$$R = -15p^2 + 300p + 12000 = -15(10)^2 + 300(10) + 12000 = -15(100) + 300(10) + 12000$$
$$= -1500 + 3000 + 12000 = \$13{,}500$$

17. The equation for the motion of a projectile fired straight up at an initial velocity of 64 ft/sec is $h = -16t^2 + 64t$, where h is the height in feet and t is the time in seconds. Find the time the projectile needs to reach its highest point. How high will it go? At what height does it start before the projectile is fired?

17. Time: 2 seconds

Height: 64 feet

Original height: 0 feet

Since the graph of this function would face down (because of the negative), the vertex would be the maximum, where t is the time of the maximum height and h is the maximum height.

$$t = -\frac{b}{2a} = -\frac{64}{2(-16)} = -\frac{64}{-32} = 2 = 2 \text{ seconds}$$

$$h = -16t^2 + 64t = -16(2)^2 + 64(2) = -16(4) + 64(2) = -64 + 128 = 64 \text{ feet}$$

The height at which it starts would be when the time is 0 seconds, or $t = 0$.

$$h = -16t^2 + 64t = -16(0)^2 + 64(0) = -16(0) + 64(0) = 0 + 0 = 0 \text{ feet}$$

18. From 1990 to 1996, the consumption of poultry per capita is modeled by $y = -0.2125t^2 + 2.615t + 56.33$, where $t = 0$ corresponds to 1990. During what year was the consumption of poultry per capita at about 61 per capita?

18. Year: 1992

$61 = -0.2125t^2 + 2.615t + 56.33$

$0 = -0.2125t^2 + 2.615t - 4.67 \qquad a = -0.2125 \quad b = 2.615 \quad c = -4.67$

$$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-2.615 \pm \sqrt{(2.615)^2 - 4(-0.2125)(-4.67)}}{2(-0.2125)} = \frac{-2.615 \pm \sqrt{2.868725}}{-0.425}$$

$$= \frac{-2.615 \pm 1.694}{-0.425} = 10 \text{ or } 2$$

Since the years span 1990 to 1996, 2 years away from 1990 is the only appropriate answer.

Therefore, the year is 1992.

Find the vertex of the quadratic function and explain how you found it. Identify the axis of symmetry. Identify the coordinate of the y-intercept. Identify the coordinates of the x-intercept(s). Also identify if the vertex of the graph is a minimum or maximum. Then graph the quadratic function.

Note: Transformations!

19. $y = 4x^2 + 8x - 45$

Vertex: $(-1, -49)$

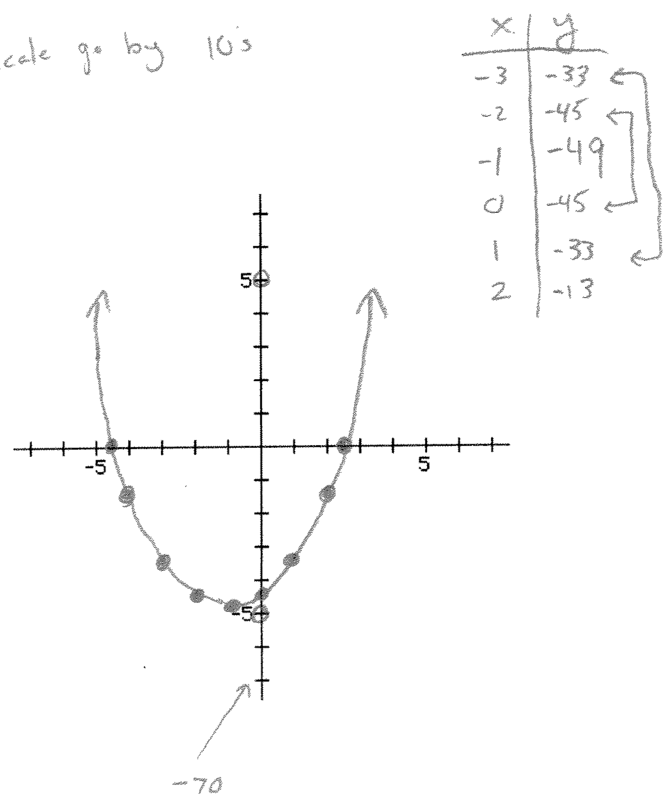
Vertex: **[Minimum]** Maximum

Axis of symmetry: $x = -1$

y-intercept: $(0, -45)$

x-intercept(s): $\left(\frac{5}{2}, 0\right)\left(-\frac{9}{2}, 0\right)$

Let y scale go by 10's



20. $y = -(x-1)^2 - 1$

- Reflect over x-axis
- Shift Right 1
- Shift Down 1

Vertex: $(1, -1)$

Vertex: Minimum **[Maximum]**

Axis of symmetry: $x = 1$

y-intercept: $(0, -2)$

x-intercept(s): None (imaginary)