Chapters Five and Six Review
R – AA – U1C5-6

Name_____ Period_____

1. Solving the quadratic equation by using any method: $3x^2 - 15 = 0$.

1. $-\sqrt{5}, \sqrt{5}$

$3x^2 - 15 = 0 \rightarrow 3x^2 = 15 \rightarrow x^2 = 5 \rightarrow x = \pm\sqrt{5}$

2. Solving the quadratic equation by using any method: $x^2 + 4x = -20$

2. $-2-4i, -2+4i$

$x^2 + 4x = -20 \rightarrow x^2 + 4x + \left(\frac{4}{2}\right)^2 = -20 + \left(\frac{4}{2}\right)^2 \rightarrow x^2 + 4x + 4 = -20 + 4 \rightarrow (x+2)^2 = -16$

$\rightarrow x + 2 = \pm\sqrt{-16} \rightarrow x + 2 = \pm 4i \rightarrow x = -2 \pm 4i$

3. Solving the quadratic equation by using any method: $3(x + 3)^2 = -12$

3. $-3-2i, -3+2i$

$3(x+3)^2 = -12 \rightarrow (x+3)^2 = -4 \rightarrow x + 3 = \pm\sqrt{-4} \rightarrow x + 3 = \pm 2i \rightarrow x = -3 \pm 2i$

4. Solving the quadratic equation by using any method: $2x^2 - 5x = 12$

4. $-\frac{3}{2}, 4$

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

$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-12)}}{2(2)} = \frac{5 \pm \sqrt{25+96}}{4} = \frac{5 \pm \sqrt{121}}{4} = \frac{5 \pm 11}{4} = 4 \text{ and } -\frac{3}{2}$

5. Solving the quadratic equation by using any method: $9x^2 - 64 = 0$

5. $-\frac{8}{3}, \frac{8}{3}$

$9x^2 - 64 = 0 \rightarrow 9x^2 = 64 \rightarrow x^2 = \frac{64}{9} \rightarrow x = \pm\sqrt{\frac{64}{9}} \rightarrow x = \pm\frac{\sqrt{64}}{\sqrt{9}} \rightarrow x = \pm\frac{8}{3}$

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

6. $4 + i$

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

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

7. $16 + 11i$

$(3 - 2i)(2 + 5i) = 6 + 15i - 4i - 10i^2 = 6 + 11i - 10i^2 = 6 + 11i - 10(-1) = 6 + 11i + 10 = 16 + 11i$

8. Factor the following expression completely: $20x^2 - 6x - 2$

8. $2(5x + 1)(2x - 1)$

$20x^2 - 6x - 2 \rightarrow 2(10x^2 - 3x - 1) \rightarrow 2(5x + 1)(2x - 1)$

9. Factor the following expression completely: $16x^2 - 81$

9. $(4x + 9)(4x - 9)$

10. Factor the following expression completely: $7u^2 - 4u - 3$

10. $(7u + 3)(u - 1)$

11. A model for Kloefkorn 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?

11. Price: $\$10$

Maximum revenue: $\$13{,}500$

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

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

12. 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?

12. Time: 2 seconds

Height: 64 feet

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

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

13. 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?

13. Year: 1992

$$61 = -0.2125t^2 + 2.615t + 56.33 \rightarrow -0.2125t^2 + 2.615t - 4.67 = 0$$

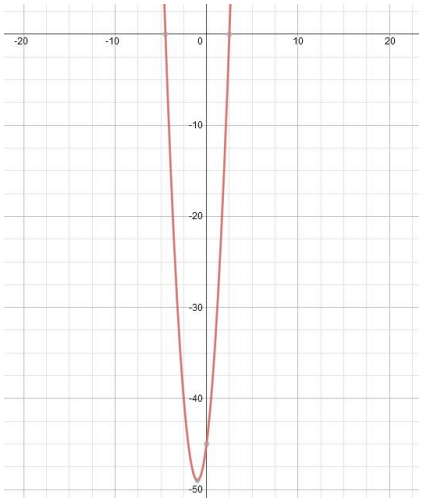
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-2.615 \pm \sqrt{(2.615)^2 - 4(-0.2125)(-4.67)}}{2(-0.2125)} = \frac{-2.615 \pm \sqrt{2.868725}}{-0.425}$$

$$= \frac{-2.615 \pm 1.694}{-0.425} = 10.1 \text{ or } 2.2$$ Since 10.1 is out of the time range, 2.2 years since 1990, or 1992, is the only solution that works.

Find the vertex of the quadratic function and explain how you found it. Identify the axis of symmetry. Identify the y-intercept. Then graph the quadratic function.

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

Graph:



Vertex: $(-1, -49)$

How did you figure out the vertex?

$$x = \frac{-b}{2a} = \frac{-(8)}{2(4)} = \frac{-8}{8} = -1$$

$$y = 4(-1)^2 + 8(-1) - 45 = -49$$

Axis of symmetry: $x = -1$

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

15. List all possible rational zeros of the function $f(x) = 5x^3 + 2x^2 + 16x + 9$. Do not find the zeros.

15. $\pm 1, \pm 3, \pm 9, \pm \frac{1}{5}, \pm \frac{3}{5}, \pm \frac{9}{5}$

$$\frac{p}{q} = \frac{\pm 1, \pm 3, \pm 9}{\pm 1, \pm 5} = \pm 1, \pm 3, \pm 9, \pm \frac{1}{5}, \pm \frac{3}{5}, \pm \frac{9}{5}$$

16. Solve the following equation, giving exact answers: $x^3 - 2x^2 - 10x + 20 = 0$.

16. $2, -\sqrt{10}, \sqrt{10}$

$$x^3 - 2x^2 - 10x + 20 = 0 \rightarrow x^2(x-2) - 10(x-2) = 0 \rightarrow (x-2)(x^2 - 10) = 0$$

$x - 2 = 0$ $\quad x^2 - 10 = 0$

$x = 2$ $\quad x^2 = 10$

$x = \pm\sqrt{10}$

17. Solve the following equation, giving exact answers: $x^4 + 3x^2 = 10$.

17. $-i\sqrt{5}, i\sqrt{5}, -\sqrt{2}, \sqrt{2}$

$$x^4 + 3x^2 = 10 \rightarrow x^4 + 3x^2 - 10 = 0 \rightarrow (x^2 + 5)(x^2 - 2) = 0$$

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

$x^2 = -5$ $\quad x^2 = 2$

$x = \pm i\sqrt{5}$ $\quad x = \pm\sqrt{2}$

18. Write a polynomial function in standard form that has zeros of 4, –2, and 0. Classify the polynomial by number of terms and degree.

18. Standard form: $f(x) = x^3 - 2x^2 - 8x$

Name by degree: Cubic

Name by number of terms: Trinomial

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

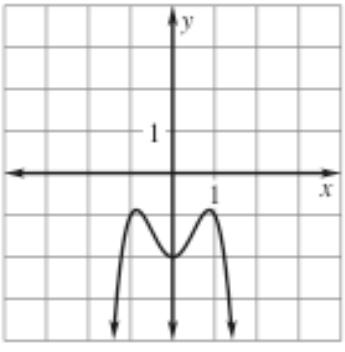
$f(x) = x(x-4)(x+2)$

$f(x) = x(x^2 + 2x - 4x - 8)$

$f(x) = x(x^2 - 2x - 8)$

$f(x) = x^3 - 2x^2 - 8x$

19. Use the graph below to approximate any relative minimums and maximums. Then identify its end behavior.



19. Max(s): $(-1, -1), (1, -1)$

Min(s): $(0, -2)$

As $x \rightarrow -\infty$, $f(x) \rightarrow$ $-\infty$

As $x \rightarrow +\infty$, $f(x) \rightarrow$ $-\infty$

20. Divide $(x^4 + 2x^3 - 3x - 1) \div (x + 4)$ by synthetic division.

20. $x^3 - 2x^2 + 8x - 35 + \frac{139}{x+4}$

–4	1	2	0	–3	–1
		–4	8	–32	140
	1	–2	8	–35	139

21. Divide $(5x^4 + 14x^3 + 9x) \div (x^2 + 3x + 1)$. by long division.

21. $5x^2 - x - 2 + \frac{16x+2}{x^2+3x+1}$

$$
\begin{array}{r}
5x^2 - x - 2 \\
x^2+3x+1 \overline{)\,5x^4+14x^3+0x^2+9x+0} \\
-\left(5x^4+15x^3+5x^2\right) \\
\hline
-x^3-5x^2+9x \\
-\left(-x^3-3x^2-x\right) \\
\hline
-2x^2+10x+0 \\
-\left(-2x^2-6x-2\right) \\
\hline
16x+2
\end{array}
$$

22. Three of the roots of a polynomial are 4, $-3i$, and $2-\sqrt{7}$. What are all of the ***roots*** of this polynomial? Explain.

22. Roots: $4, -3i, 3i, 2-\sqrt{7}, 2+\sqrt{7},$

Explanation:

Complex and radical conjugates are needed to eliminate "middle terms" that contain radicals and complex numbers.

23. Find the zeros and multiplicity of zeros of the following function: $f(x) = 2x^5 - 12x^4 + 18x^3$.

$0 = 2x^5 - 12x^4 + 18x^3 \rightarrow 0 = 2x^3\left(x^2 - 6x + 9\right)$

$\rightarrow 0 = 2x^3(x-3)(x-3) \rightarrow 0 = 2x^3(x-3)^2$

$2x^3 = 0 \quad (x-3)^2 = 0$

$x = 0 \qquad x = 3$

23. Zeros: 0, 3

Multiplicities: 0 (multiplicity of 3), 3 (multiplicity of 2),