Advanced Algebra – Chapters 5 and 6 Review

Name KEY Period

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

No "bx" term
Sq. Roots

$3x^2 - \cancel{15} = 0$
$+15 \quad +15$

$\frac{\cancel{3}x^2}{\cancel{3}} = \frac{15}{3}$

$\sqrt{x^2} = \sqrt{5}$

$x = \pm\sqrt{5}$

1. $X = \pm\sqrt{5}$

2 solutions!

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

"bx" term: Factor
Q. Formula
Complete the Square

$+20 \quad +20$

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

Doesn't Factor ~~$(x \quad)(x \quad) = 0$~~

a = 1
b = 4
c = 20

$x = \frac{-(4) \pm \sqrt{(4)^2 - (4)(1)(20)}}{2(1)} = \frac{-4 \pm \sqrt{16-80}}{2} = \frac{-4 \pm \sqrt{-64}}{2} = \frac{-\cancel{4} \pm \cancel{8}i}{\cancel{2}} = -2 \pm 4i$

2. $X = -2 + 4i$ and $-2 - 4i$

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

Isolate the "x".

$\frac{\cancel{3}(x+3)^2}{\cancel{3}} = \frac{-12}{3}$

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

$x + \cancel{3} = \pm 2i$
$\cancel{-3} \quad -3$

$X = -3 \pm 2i$

3. $X = -3 + 2i$ and $-3 - 2i$

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

"bx" term: Factor
Q. Formula
Complete the Square

$-12 \quad -12$

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

FACTOR

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

$+3x$
$-12x$
$\boxed{-5x}$

12	
1	12
2	6
3	4

$2x + 3 = 0$
$2x = -3$
$x = -\frac{3}{2}$

$x - 4 = 0$
$x = 4$

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

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

$= \frac{5 \pm \sqrt{121}}{4} = \frac{5 \pm 11}{4}$

$\frac{5+11}{4} = \frac{16}{4} = 4$

$\frac{5-11}{4} = \frac{-6}{4} = \frac{-3}{2}$

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

No "bx" term
Sq. Roots

$+64 \quad +64$

$\frac{\cancel{9}x^2}{\cancel{9}} = \frac{64}{9}$

$\sqrt{x^2} = \sqrt{\frac{64}{9}}$

$x = \pm\frac{\sqrt{64}}{\sqrt{9}} = \pm\frac{8}{3}$

5. $X = \pm\frac{8}{3}$ or $2\frac{2}{3}$

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

$4 + i$

6. $4 + i$

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

$6 + 15i - 4i - 10i^2$

$6 + 11i - 10(-1)$

$6 + 11i + 10$

$16 + 11i$

7. $16 + 11i$

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

$2(10x^2 - 3x - 1)$

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

$+2x$

$-5x$

$-3x$

FACTOR:
1. GCF
2. Look for perfect squares
3. "The FACE" ( )( ) ... reverse FOIL
4. ✓ by FOILING

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

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

perfect squares

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

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

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

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

$+3u$

$-7u$

$-4u$

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?

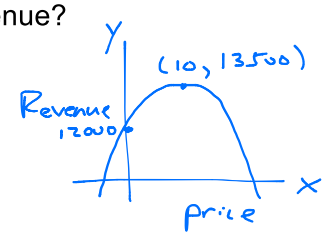
$x = \frac{-300}{2(-15)} = \frac{+300}{+30} = \frac{30}{3} = 10$

$R = -15(10)^2 + 300(10) + 12000$

$-1500 + 3000 + 12000$

$1500 + 12000$

13500



11. Price: \$10.00 per item

Maximum revenue: \$13,500.00

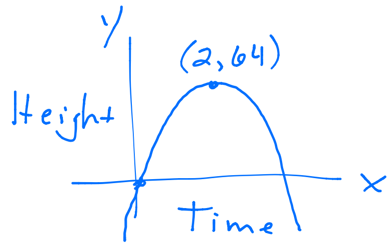
12. The equation for the motion of a projectile fired straight up at an initial velocity of 64 ft/sec is $h = -16t^2 + 64t$, where h is the height in feet and t is the time in seconds. Find the time the projectile needs to reach its highest point. How high will it go?

12. Time: 2 seconds

Height: 64 ft.

$$x = \frac{-b}{2a} = \frac{+64^{32}}{\cancel{2}(+16)} = \frac{32}{16} = 2$$

$$h(2) = -16(2)^2 + 64(2)$$
$$= -16(4) + 128$$
$$= -64 + 128$$
$$= 64$$

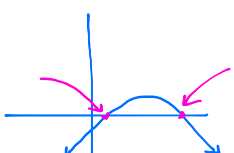


13. From 1990 to 1996, the consumption of poultry per capita is modeled by $y = -0.2125t^2 + 2.615t + 56.33$, where $t = 0$ corresponds to 1990. During what year was the consumption of poultry per capita at about 61 per capita?

13. Year: 1992

$$\cancel{61} = -.2125t^2 + 2.615t + 56.33$$
$$-61 \qquad\qquad\qquad -61$$

$$0 = -.2125t^2 + 2.615t - 4.67$$



Solve for t.
-- Use Quad. Formula
-- Use Calc. to find "Zeros".

$t = 2.167$ ≈ 2 yrs. after 1990 so 1992

$t = 10.14$ ≈ 10 yrs. after 1990 so ~~2000~~

Not between 1990–1996

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

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

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

Vertex: $(-1, -49)$

$\frac{-b}{2a}$ $\quad f\left(\frac{-b}{2a}\right)$

How did you figure out the vertex?
$x = \frac{-b}{2a}$. This is the x-coordinate of the Vertex. Then, substitute the "x" into the equation to find the y-coordinate of the Vertex.

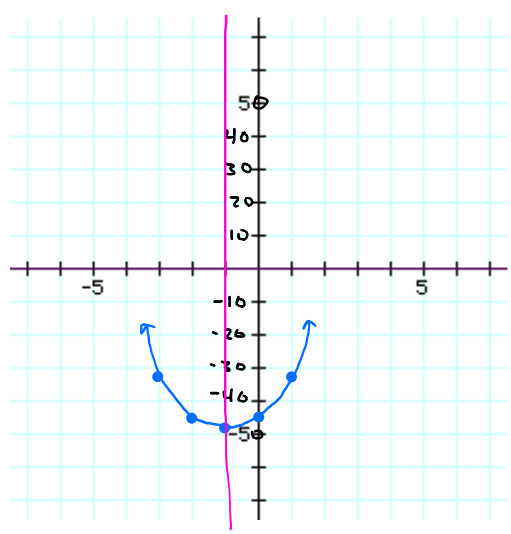
Axis of symmetry: $x = -1$

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

plug 0 in for x.

x	y
-3	-33
-2	-45
-1	-49
0	-45
1	-33

Graph: $x = -1$



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

q p

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

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

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

3 TOTAL ZEROS

Check: $\cancel{\pm 1}, \pm 2, \pm 4, \pm 5, \pm 10, \pm 20$

$$\begin{array}{c|cccc} 2 & 1 & -2 & -10 & 20 \\ & \downarrow & 2 & 0 & -20 \\ \hline & 1 & 0 & -10 & \boxed{0} \\ & x^2 & x & c & \end{array}$$

$x^2 - 10 = 0$

$+10 \quad +10$

$\sqrt{x^2} = \sqrt{10}$

$x = \pm\sqrt{10}$

16. $x = 2, \pm\sqrt{10}$

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

$-10 \quad -10$

$x^4 + 3x^2 - 10 = 0$

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

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

$\sqrt{x^2} = \sqrt{2}$ $\qquad$ $\sqrt{x^2} = \sqrt{-5}$

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

17. $x = \pm\sqrt{2}, \pm i\sqrt{5}$

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.

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

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

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

$x^3 - 2x^2 - 8x$

18. Standard form: $x^3 - 2x^2 - 8x$

Name by degree: Cubic

Name by number of terms: Trinomial

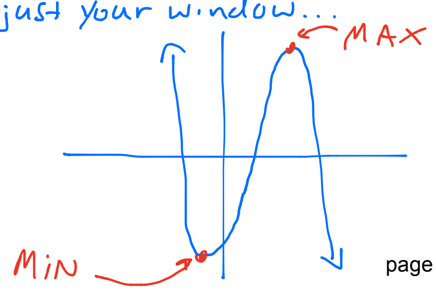
19. Describe the end behavior of the function

$f(x) = -2x^3 + 5x^2 + 9x - 10$ by filling in the blanks.

ODD Negative

Also, use your graphing calculator to find the relative maximum(s) and minimum(s).

Adjust your window...



19. $\lim_{x \to -\infty} f(x) = \infty$ up

$\lim_{x \to +\infty} f(x) = -\infty$ Down

Relative maximum(s) (2.31, 12.82)

Relative minimum(s) (−0.65, −13.19)

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

$0x^2$

$$\begin{array}{r|rrrrr} -4 & 1 & 2 & 0 & -3 & -1 \\ & \downarrow & -4 & 8 & -32 & 140 \\ \hline & 1 & -2 & 8 & -35 & \boxed{139} \\ & x^3 & x^2 & x & c & \end{array}$$

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

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

$$\begin{array}{r|l} & 5x^2 - x - 2 \\ \hline x^2+3x+1 & \cancel{5x^4} + 14x^3 + 0x^2 + 9x + 0 \\ & +(\cancel{-5x^4} - 15x^3 - 5x^2) \\ \hline & \cancel{-1x^3} - 5x^2 + 9x \\ & +(+1x^3 + 3x^2 + x) \\ \hline & \cancel{-2x^2} + 10x + 0 \\ & +(+2x^2 + 6x + 2) \\ \hline & 16x + 2 \end{array}$$

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

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.

$x^2 = -9$

$x = \pm\sqrt{-9}$

$x = \pm 3i$

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

Explanation:

Imaginary Root Theorem and Irrational Root Theorem… Solving a quadratic gives a positive and a negative complex #. Same with irrational #'s.

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

$2x^3(x^2 - 6x + 9) = 0$

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

$(x-3)^2$

$x = 0$ multiplicity 3

$x = 3$ multiplicity 2

23. Zeros: $x = 0$ $x = 3$

Multiplicities: Mult. of 3 Mult. of 2