Advanced Algebra
Chapter 6 Review

Name Key
Date_____ **Period** ___

For problems 1 – 2, perform the indicated operations and write the polynomial in standard form. Then classify it by degree and number of terms.

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

$-2x^3+10x^2-10x^2$

Standard Form: $-2x^3$

Name by Degree: cubic

Name by Number of Terms: monomial

2. $(11x^2-x+9)-(3x+11x^2-41)$

$11x^2-x+9-3x-11x^2+41$

Standard Form: $-4x+50$

Name by Degree: linear

Name by Number of Terms: binomial

3. Write a polynomial function in factored form with the given zeros.
   a. -2, -1, 3 **b.** -3, 4 (with multiplicity 3)

$f(x)=(x+2)(x+1)(x-3)$ $f(x)=(x+3)(x-4)^3$

4. Find the zeros of the function and state the multiplicity when appropriate.
   a. $f(x)=(x-5)(x+1)^4$ **b.** $f(x)=x^3(x+2)(x+1)^2$

$x=5, -1$ (mult. of 4) $x=0$ (mult. of 3), -2, -1 (mult. of 2)

For problem 5, use the function: $f(x)=x^4-x^3-12x^2$.

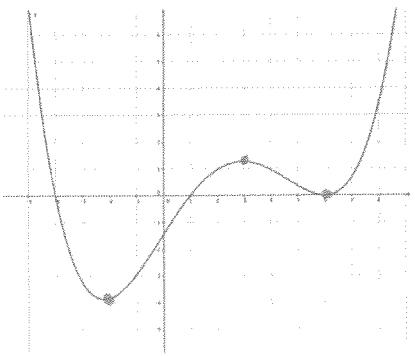
5a) Write the function in factored form. $x^2(x^2-x-12)$

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

5b) Determine the zeros of the function and any multiplicity.

$x=0$ (mult. of 2), 4, -3

6a) Approximate all relative minimums and maximums for the following function.



Relative Max(s): $(3, 1.2)$

Relative Min(s): $(-2, -4)$ and $(-6, 0)$

Fill in the blanks describing the end behavior of f(x).

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

As $x \to +\infty$, $f(x) \to$ $+\infty$

Write a possible function in factored form for the graph shown.

$f(x)=(x+4)(x-1)(x-6)^2$

6b) Fill in the blanks describing the end behavior of $f(x) = 2x^4 + 3 - 6x^7$.

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

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

Divide with long division.

7. $(3x^3 + 13x^2 - 19x + 11) \div (3x - 2)$

$$\begin{array}{r} x^2 + 5x - 3 \\ 3x-2 \overline{)\,3x^3 + 13x^2 - 19x + 11} \\ -3x^3 + 2x^2 \\ \hline 15x^2 - 19x \\ -15x^2 + 10x \\ \hline -9x + 11 \\ +9x + -6 \\ \hline 5 \end{array}$$

$x^2 + 5x - 3$ R: 5

Divide with synthetic division.

8. $(x^4 + 5x^2 + 4x + 12) \div (x + 2)$

$$\begin{array}{r|rrrrr} -2 & 1 & 0 & 5 & 4 & 12 \\ & & -2 & 4 & -18 & 28 \\ \hline & 1 & -2 & 9 & -14 & (40) \end{array}$$

$x^3 - 2x^2 + 9x - 14$ R: 40

Given one factor, use division to completely factor the polynomial.

9. $(x^3 - 3x^2 - x + 3); (x + 1)$

$$\begin{array}{r|rrrr} -1 & 1 & -3 & -1 & 3 \\ & & -1 & 4 & -3 \\ \hline & 1 & -4 & 3 & (0) \end{array}$$

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

$x^2 - 4x + 3$

$(x-3)(x-1)$

10-11 Given the polynomial, $x^3 - 4x^2 - 3x + 18$, determine if the following binomials are factors. How do you know if it is a factor or not? If the remainder is zero, then the binomial is a factor.

10. $(x - 4)$ NO

$$\begin{array}{r|rrrr} 4 & 1 & -4 & -3 & 18 \\ & & 4 & 0 & -12 \\ \hline & 1 & 0 & -3 & (6) \end{array}$$

11. $(x + 2)$

$$\begin{array}{r|rrrr} -2 & 1 & -4 & -3 & 18 \\ & & -2 & 12 & -18 \\ \hline & 1 & -6 & 9 & (0) \end{array}$$

YES

12-13 Write a polynomial function in factored form.

12. -5 and $2i$

$f(x) = (x + 5)(x - 2i)(x + 2i)$

13. $-3i$, -8 and 7

$f(x) = (x + 3i)(x - 3i)(x + 8)(x - 7)$

14-15 List ALL the POSSIBLE rational roots of each polynomial.

14. $f(x) = 5x^3 - x^2 - 32x - 27$

$\frac{p}{q} = \pm\frac{1}{1}, \pm\frac{3}{1}, \pm\frac{9}{1}, \pm\frac{27}{1}, \pm\frac{1}{5}, \pm\frac{3}{5}, \pm\frac{9}{5}, \pm\frac{27}{5}$

15. $f(x) = 2x^4 + 13x^2 + 7x - 12$

$\frac{p}{q} = \pm\frac{1}{1}, \pm\frac{2}{1}, \pm\frac{3}{1}, \pm\frac{4}{1}, \pm\frac{6}{1}, \pm\frac{12}{1}, \pm\frac{1}{2}, \pm\frac{3}{2}$

16-17. Factor the polynomials.

16. $x^4 - 16$

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

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

17. $x^4 - 8x^3 + 12x^2$

$x^2(x^2-8x+12)$

$x^2(x-6)(x-2)$

18-21, Solve each equation. Give exact answers, and state any multiplicity.

18. $x^3 - 2x^2 - 5x + 6 = 0$

$\frac{p}{q} = \pm\frac{1}{1}, \pm\frac{2}{1}, \pm\frac{3}{1}, \pm\frac{6}{1}$

Guess ↓ 1

1	1	−2	−5	6
		1	−1	−6
	1	−1	−6	0

Quadratic

$x^2 - x - 6 = 0$

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

Solutions: $x = 3, -2, 1$

19. $6x^2 = x^4 - x^3$

$-6x^2 \quad -6x^2$

$0 = x^4 - x^3 - 6x^2$

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

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

Solutions: $x = 0$ (mult. of 2), $3, -2$

20. $x^4 - 8x^2 = 9$

$-9 \quad -9$

$x^4 - 8x^2 - 9 = 0$

$(x^2-9)(x^2+1) = 0$

$x^2 - 9 = 0$

$x^2 = 9$

$x = \pm 3$

$x^2 + 1 = 0$

$x^2 = -1$

$x = \pm i$

Solutions

(Solve.)

21. $x^3 - x^2 - 14x = -8$

$x^3 - x^2 - 14x + 8 = 0$

$\frac{p}{q} = \pm\frac{1}{1}, \pm\frac{2}{1}, \pm\frac{4}{1}, \pm\frac{8}{1}$

Guess → 4

	1	-1	-14	8
		4	12	-8
	1	3	-2	0

Quadratic

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

$x = \frac{-3 \pm \sqrt{3^2 - 4(1)(-2)}}{2(1)}$

$x = \frac{-3 \pm \sqrt{17}}{2}, 4$

CALCULATOR PART

22. **Use your calculator to approximate the coordinates of the zeros, any relative maximums, any relative minimums and determine the end behavior of the following functions.**

a. $y = .5x^3 + 3.5x^2 + 2x - 6$

Zeros: $-6, -2, 1$

$x \to -\infty \quad f(x) \to -\infty$

$x \to +\infty \quad f(x) \to +\infty$

End Behavior

relative max: $(-4.36, 10.37)$

relative min: $(-.31, -6.30)$

b. $y = .25x^3 - 1.5x^2 + 1.25x + 3$

Zeros: $-1, 3, 4$

$x \to -\infty \quad f(x) \to -\infty$

$x \to +\infty \quad f(x) \to +\infty$

relative max: $(.47, 3.28)$

relative min: $(3.53, -.28)$