NAME

1) **Section 5.1** (4 points) Simplify and write the answer in standard form. Then classify the resulting polynomial by degree and by the number of terms.

$$5(x^2 - 3) + 2x - 4(x - x^2) + 7(x - 1)(x + 2)$$

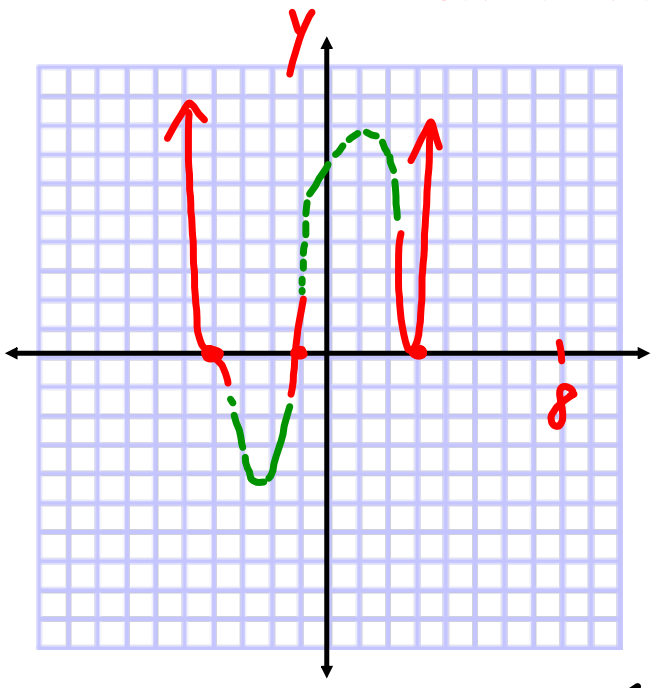
$5x^2 - 15 + 2x - 4x + 4x^2 + 7x^2 + 7x - 14$

$16x^2 + 5x - 29$

QUADRATIC TRINOMIAL

2) **Section 5.2** (6 points) Graph the function given below. Give only the portion of the graph around each x-intercept. Be clear as to whether the graph "bounces" off the x-axis, goes straight through the x-axis, or "wiggles" through the x-axis. Be sure to consider the end-behavior of the graph.

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



$f(x) = 1x^6 + \cdots$

NOTE: GREEN PORTION NOT ACCURATE!

( )^1 → STRAIGHT THROUGH

( )$^{\text{EVEN}}$ → BOUNCE

( )$^{\text{ODD} > 1}$ → WIGGLE

3) **Section 5.3** (6 points) Find *all* solutions to the polynomial equation given below.

$16x^3 = 54$

$16x^3 - 54 = 0$

$2(8x^3 - 27) = 0$

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

$A^3 - B^3 = (A-B)(A^2 + AB + B^2)$

* $8x^3 - 27 = (2x-3)(4x^2+6x+9)$

$x = \frac{3}{2}$

Q.F.

$x = \frac{-6 \pm \sqrt{36 - 4(4)(9)}}{2(4)}$

$= \frac{-6 \pm \sqrt{-108}}{8}$

$= \frac{-6 \pm i\sqrt{108}}{8}$

$= \frac{-6 \pm 6i\sqrt{3}}{8}$

$= \frac{-3 \pm 3i\sqrt{3}}{4}$

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

4) **Section 5.3** (6 points) Find *all* solutions to the polynomial equation given below.

$$3x^4 + 12x^2 - 15 = 0$$

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

$3(x^2 - 1)(x^2 + 5) = 0$

$x^2 = 1 \qquad x^2 = -5$

$x = \pm\sqrt{1} \qquad x = \pm\sqrt{-5}$

$x = \pm 1 \;,\; \pm i\sqrt{5}$

5) **Section 5.4** (6 points) Divide the polynomials using *Long Division*.

$(3x^5 - 7x^4 - 3x^2 - 8x - 2) \div (x^2 - 3)$

$$
\begin{array}{r}
3x^3 - 7x^2 + 9x - 24 \\
x^2 - 3 \overline{\big)\, 3x^5 - 7x^4 + 0x^3 - 3x^2 - 8x - 2} \\
\underline{3x^5 \qquad - 9x^3} \\
-7x^4 + 9x^3 - 3x^2 \\
\underline{-7x^4 \qquad + 21x^2} \\
9x^3 - 24x^2 - 8x \\
\underline{9x^3 \qquad - 27x} \\
-24x^2 + 19x - 2 \\
\underline{-24x^2 \qquad + 72} \\
19x - 74
\end{array}
$$

$$3x^3 - 7x^2 + 9x - 24 + \frac{19x - 74}{x^2 - 3}$$

6) **Section 5.4** (5 points) Divide the polynomials using *Synthetic Division*.

$(3x^3 - 12x^2 - 4x + 7) \div (x - 2)$

$$\begin{array}{c|cccc} 2 & 3 & -12 & -4 & 7 \\ & & 6 & -12 & -32 \\ \hline & 3 & -6 & -16 & -25 \end{array}$$

$$3x^2 - 6x - 16 - \frac{25}{x-2}$$

7) **Section 5.5/5.6** (6 points) Find *all* solutions to the polynomial equation given below.

$12x^3 - 32x^2 + 25x = 6$

$12x^3 - 32x^2 + 25x - 6 = 0$

POSSIBLE RATIONAL SOLUTIONS

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

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

	12	−32	25	−6	
1	12	−20	5	−1	
−1	12	−44	69	−75	LOWER BOUND
2	12	−8	9	12	
3	12	4	37	105	UPPER BOUND
$\frac{1}{2}$	12	−26	12	0	

$12x^2 - 26x + 12 = 0$

$2(6x^2 - 13x + 6) = 0$

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

36

$-9 \quad 3 \quad -3$

$-4 \quad 2 \quad -2$

-13

$x = \frac{1}{2}, \frac{2}{3}, \frac{3}{2}$

7a) $f(-x) = -12x^3 - 32x^2 - 25x - 6$

No Sign Changes of $f(-x)$.

So, No Negative Solutions.

8) **Section 5.5/5.6** (6 points) Find *all* solutions to the polynomial equation given below.

$9x^4 + 3x^3 - 30x^2 + 6x + 12 = 0$

FIRST, NOTICE THE GCF.

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

$P(x) = 3x^4 + x^3 - 10x^2 + 2x + 4$

HAS 2 SIGN CHANGES.

SO, THERE ARE 2 OR 0 POSITIVE SOLUTIONS.

$P(-x) = +\ -\ -\ -\ +$

2 SIGN CHANGES $\Rightarrow$ 2, 0 NEGATIVE SOLUTIONS.

3	1	-10	2	4
1	3	4	-6	-4	0

POSSIBLE RATIONAL SOLUTIONS

$\pm \frac{1, 2, 4}{1, 3}$

$1, \frac{1}{3}, 2, \frac{2}{3}, 4, \frac{4}{3}$

$-1, -\frac{1}{3}, -2, -\frac{2}{3}, -4, -\frac{4}{3}$

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

3	4	-6	-4
1	3	7	1	-3
-1	3	1	-7	3
2	3	10	14	24
-2	3	-2	-2	0

UPPER BOUND OF 2

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

$x = \frac{2 \pm \sqrt{4 - (-24)}}{2(3)}$

$x = \frac{2 \pm \sqrt{28}}{6} = \frac{2 \pm 2\sqrt{7}}{6} = \frac{1 \pm \sqrt{7}}{3}$

$x = 1, -2, \frac{1+\sqrt{7}}{3}, \frac{1-\sqrt{7}}{3}$