Name: Key

Math 163 Test #2

Overall Points (60 pts) (Total points will be multiplied by 5/3 in order to get a score out of 100)

1) What is the degree of the function: $f(x) = -4x^5 + 3x^3 - 8x^2 + 10$? (2 pts) 5

2) Describe the end behavior in the functions shown below: (2 pts each)

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

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

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

b) $g(x) = 6x^5 - 3x^4 - 2x^2 + 6$

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

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

3) Given the function $f(x) = |x - 2| + 3$, then what would be the new equation of the function if you 1) shifted the graph 3 units right, 2) reflected the graph over the x axis, then 3) shifted the graph 5 units down? (3pts)

1) $f(x) = |x-5|+3$

2) $f(x) = -|x-5|-3$

3) $f(x) = -|x-5|-8$

4) Using Synthetic Division divide the following polynomials, then state why the denominator is or isn't considered a factor of the numerator. (6 pts)

$$\frac{4x^4 - 2x^2 + 6x - 1}{x + 2} = 4x^3 - 8x^2 + 14x - 22 + \frac{43}{x+2}$$

$$\begin{array}{r|ccccc} -2 & 4 & 0 & -2 & 6 & -1 \\ & \downarrow & -8 & 16 & -28 & 44 \\ \hline & 4 & -8 & 14 & -22 & 43 \end{array}$$

5) Using long division divide the following polynomials: (5 pts)

$$\frac{6x^3 - 4x^2 + 8x + 1}{2x - 3}$$

$3x^2 + \frac{5}{2}x + \frac{31}{4} + \frac{97}{4(2x-3)}$

$2x-3 \overline{)\,6x^3 - 4x^2 + 8x + 1}$

$(-)\ 6x^3 - 9x^2$

$5x^2 + 8x$

$(-)\ 5x^2 - \frac{15}{2}x$

$\frac{31}{2}x + 1$

$(-)\ \frac{31}{2}x - \frac{93}{4}$

$\frac{97}{4}$

$= 3x^2 + \frac{5}{2}x + \frac{31}{4} + \frac{97}{4(2x-3)}$

OR

$= 3x^2 + \frac{5}{2}x + \frac{31}{4} + \frac{97}{8x-12}$

6) List all possible rational zeros of the function: $g(x) = 4x^3 + 3x^2 - 5x + 6$ (4 pts)

$\frac{P}{q}: \frac{\pm 1, \pm 2, \pm 3, \pm 6}{\pm 1, \pm 2, \pm 4}$

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

7) Using Descartes Rule of Sign Changes state the number of possible positive real zeros and the number of possible negative real zeros of the function: (4 pts)

$g(x) = -3x^4 - 6x^3 + 5x^2 + 3x - 2$

$g(x)$ has 2 sign changes

Possible (+) Reals: 2 or 0

$g(-x) = -3x^4 + 6x^3 + 5x^2 - 3x - 2$

Possible (−) Reals: 2 or 0

8) Factor the polynomial $f(x) = 2x^3 - x^2 - 12x - 9$ (6 pts)

$$\begin{array}{r|cccc} -1 & 2 & -1 & -12 & -9 \\ & \downarrow & -2 & 3 & 9 \\ \hline & 2 & -3 & -9 & 0 \end{array}$$

$$f(x) = (x+1)(2x^2 - 3x - 9)$$
$$f(x) = (x+1)(x-3)(2x+3)$$

9) Solve the equation: $x^3 - 4x^2 - 9x + 36 = 0$ (7 pts)

$$\begin{array}{r|cccc} 3 & 1 & -4 & -9 & 36 \\ & \downarrow & 3 & -3 & -36 \\ \hline & 1 & -1 & -12 & 0 \end{array}$$

$$: (x-3)(x^2 - x - 12)$$
$$: (x-3)(x-4)(x+3)$$

$$x = 3 \quad , x = 4 \quad , x = -3$$

10) Factor the polynomial $f(x) = 8x^3 + 4x^2 - 10x + 3$ given one of the zeros of the function is ½. (7 pts)

$$\begin{array}{r|cccc} \frac{1}{2} & 8 & 4 & -10 & 3 \\ & \downarrow & 4 & 4 & -3 \\ \hline & 8 & 8 & -6 & 0 \end{array}$$

$$f(x) = (2x-1)(8x^2 + 8x - 6)$$
$$= (2x-1)(2x+3)(4x-2)$$
$$= 2(2x-1)(2x+3)(2x-1) \quad \text{OR}$$

11) What is one possible function of degree 3 given two of the zeros of the function are (3 – 2i) and -4? (6 pts)

$$f(x) = (x+4)(x-(3-2i))(x-(3+2i))$$
$$= (x+4)(x-3+2i)(x-3-2i)$$
$$= (x+4)(x^2-3x-2xi-3x+9+6i+2xi-6i-4i^2)$$
$$= (x+4)(x^2-6x+9-4(-1))$$
$$= (x+4)(x^2-6x+13)$$
$$= x^3-6x^2+13x+4x^2-24x+52$$
$$f(x) = x^3-2x^2-11x+52$$

12) Simplify: (3 + 4i)(2 – 5i) = (3 pts)

$$= 6-15i+8i-20i^2$$
$$= 6-7i-20(-1)$$
$$= 26-7i$$

13) How many imaginary zeros does this function have if it is a degree 5 polynomial? (3 pts)

2 imaginary