

(4 points) Name: _____

Test 2
Fall 2006
MATH 111 Section 02
October 6, 2006

Directions : You have 50 minutes to complete all 5 problems on this exam. There are a possible 100 points to be earned. You may not use your book, notes, or any graphing/programmable calculator. Please be sure to show all pertinent work. *An incorrect answer with no work will receive no credit!* If any portion of the exam is unclear please come to me and I will elaborate provided I can do so without giving away the problem.

1. (10 points)

True or False. (2 points each)

- (a) There exists a polynomial $p(x)$ so that $p(x) \neq 0$ for any real number x .

- (b) There exists a polynomial $q(x)$ whose degree is odd so that $q(x) \neq 0$ for any real number x .

- (c) There exist polynomials $p(x)$ and $q(x)$ so that the rational polynomial $r(x) = p(x)/q(x)$ has no vertical asymptotes.

- (d) There exist polynomials $p(x)$ and $q(x)$ so that the rational polynomial $r(x) = p(x)/q(x)$ has no x -intercepts.

- (e) Given a polynomial $p(x)$, the number of real number solutions to the equation $p(x) = 0$ is equal to the degree of the polynomial.

2. (15 points)

Let $p(x) = -2x^6 - 2x^5 - 2x^4 - 3x^3 - 4x + 2$. What are all possibilities of the number of positive solutions, negative solutions, and complex solutions to the equation $p(x) = 0$?

3. (15 points)

Find a third degree polynomial $f(x)$ with the property that $f(0) = 1$, $f(-1) = 0$, $f(1) = 0$, and $f(2) = 0$.

4. (20 points)

Do the following functions have horizontal or oblique asymptotes? If the asymptote is horizontal, what is it? [Do **not** compute the oblique asymptotes.]

(a)

$$f(x) = \frac{\pi x^2 - 3x + 1}{2x^2}$$

(b)

$$g(x) = \frac{3x^3 - x^2 + 5x + 6}{x^2 + 2x + 1}$$

(c)

$$h(x) = 3$$

(d)

$$k(x) = \frac{1380981x^2 + 1985x + 10^{100}}{0.00000000001x^3}$$

5. (36 points)

There are 6 parts to this problem; each part is worth 6 points. Consider the rational function:

$$f(x) = \frac{x^3 + x^2 - 14x - 24}{x^2 - x - 6}.$$

- (a) Where are the x -intercepts if any?
- (b) Where are the vertical tangent lines if any?
- (c) Where are there holes in the graph if any?
- (d) Where is the y -intercept if any?
- (e) What is the horizontal/oblique asymptote?
- (f) Sketch the graph.