MAT 161 **Test 1** **Name** _____

Spring 2016

Instructions: To receive credit for all answers, show all work clearly in the space provided. You may use graphing calculators. This is designed to be a 50 minute test.

1. Find the indicated limits. If the limit does not exist, tell why.

a. $\lim_{x\to 5} \dfrac{x^2-25}{2x^2-10x}$

b. $\lim_{x\to 6} \dfrac{x^2-25}{2x^2-10x}$

c. $\lim_{x\to 0} \dfrac{x^2-25}{2x^2-10x}$

d. $\lim_{x\to -\infty} \dfrac{x^2-25}{2x^2-10x}$

2. a. Suppose that for all real numbers x, $70\sqrt{x} \le f(x) \le 25x+49$, Is f(x) continuous at 49/25 ? Why or why not?

b. Is the function f(x) in question 2a continuous at x = 2? Why or why not?

3. Using the precise (δ, ε) definition of limits, prove that $\lim_{x \to 2} (-3x + 4) = -2$

4. Suppose f(x) and its derivative both have all real numbers as a domain and the graph of y = f(x) has a horizontal asymptote of y = 4.

   a. What is $\lim_{x \to +\infty} f(x)$?

   b. What is $\lim_{x \to +\infty} \dfrac{f(x+h) - f(x)}{h}$ if h is a fixed nonzero number?

5. Use the Intermediate Value Theorem to find an interval where there is a solution to the equation $8.1 = 6x - x^2$ in the interval.

6. a. Use the definition of a derivative to find $f'(x)$ where $f(x) = 5x^2 + 3x$.

b. Firnd the equation of the tangent line to the graph of y = f(x) at (2, 26) ?

c. Find the instantaneous rate of change of y = f(x) with respect to x when x = -2.

d. Find the average rate of change of y = f(x) with respect to x over the interval [-1 , 1] ?

7. Find f"(3) if $f(x) = \dfrac{1+2x}{2+x}$.