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

Fall 2016 version 1

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. $\lim_{x \to -7} \dfrac{x^2 + x - 42}{x^2 - 49}$

b. $\lim_{x \to 7^-} \dfrac{x^2 + x - 42}{x^2 - 49}$

c. $\lim_{x \to 10} \dfrac{x^2 + x - 42}{x^2 - 49}$

d. $\lim_{x \to +\infty} \dfrac{x^2 + x - 42}{x^2 - 49}$

2. a. Suppose that for all real numbers x, $4(x-1) \le f(x) \le x^2$, Is f(x) continuous at 1 ? 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 $\lim_{x \to 3} (5x + 2) = 17$

4. Suppose f(x) > 0 for all real numbers greater than 4 as a domain and the graph of y = f(x) has a vertical asymptote at x = 4.

   a. What is $\lim_{x \to 4^+} f(x)$?

   b. Can you calculate $\lim_{x \to 4^-} f(x)$? Why or why not?

5. Use the Intermediate Value Theorem to find an interval where there is a solution to the equation $6 = 6x - x^3$ in the interval.

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

b. Find the equation of the tangent line to the graph of y = f(x) at (1, -2) .

c. Find the instantaneous rate of change of y = f(x) with respect to x when x = 4.

d. Find the average rate of change of y = f(x) with respect to x over the interval [2 , 4] ?

7. Find $f'(x)$ if $f(x) = \dfrac{3+2x}{1+5x}$.