

Departement of Math and CS 1st Midterm Test Exam Duration: 75 min.

Calculators, mobile phones, pagers and all other mobile communication equipment are NOT allowed

Instructions: (i) Read each question carefully. (ii) Remember to show all work in order to receive full credit.

1. Evaluate the following limit, if it exists, (2 pts. each)

(a)

$$\lim_{x \rightarrow 0} \frac{2x + 2 \tan 3x}{\sin 2x}$$

(b)

$$\lim_{x \rightarrow 3} \left[3x + (x - 3)^4 \sin \frac{1}{\sqrt[3]{x - 3}} \right]$$

2. Find the vertical and horizontal asymptotes, if any, for (4 pts.)

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

3. Let

$$f(x) = \frac{|x + 2|}{\sqrt{x}(x^2 + x - 2)}$$

Classify the discontinuities of f as jump, removable or infinite. (5 pts)

4. (a) State the intermediate value theorem. (1 pt.)

(b) Use the intermediate value theorem to show that the equation

$$x^2 \cos \pi x + 3x - 1 = 0$$

has a real root. (2 pts.)

5. (a) Use the definition of the derivative to find $f'(1)$, where (2 pts. each)

$$f(x) = \frac{1}{1 + \sqrt{x}}$$

(b) Find an equation of the normal line to the graph of f at $x = 1$.

6. Find $f'(x)$, where (4 pts.)

$$f(x) = \frac{\sec x}{x^3 + \cot x}$$

Note that it is important that you try to solve ALL questions.
Good Luck!