



Name: _____

Mark:
25

MATH 100 (Fall, 2022)

Test 2A

1. Let $f(x) = 2 \cos x - x$.

(a) (3 marks) If Newton's Method were used to approximate a zero of $f(x)$ using an initial approximation of $x_1 = 1$, then compute the next approximation x_2 . Round your answer to four decimal places.

(b) (3 marks) Verify that f satisfies the conditions of the Mean Value Theorem on the closed interval $[0, 2\pi]$, and find all values of c in the open interval $(0, 2\pi)$ that satisfy the Mean Value Theorem formula.

2. (3 marks) Find dy/dx given the equation $x \tan y = y \tan x$.

3. (4 marks) Consider the function $f(x) = \frac{5x^2}{(x-1)^4}$, whose derivative is $f'(x) = -\frac{10x(x+1)}{(x-1)^5}$. Find the intervals on which f is increasing or decreasing and find the coordinates of all critical points of f . Classify each critical point as a relative maximum, relative minimum or neither.

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4. (6 marks) An observer on the ground sights an approaching plane flying at an altitude of 3,500 meters and at a constant speed. From his point of view, the plane's angle of elevation is increasing at a rate of 0.01 radians per second when the angle is $\pi/6$. What is the speed of the plane?

5. (6 marks) Consider a rectangle having a perimeter of 42 centimeters. Form a cylinder by revolving this rectangle about one of its edges. What dimensions of the rectangle will result in a cylinder of maximum volume? Use the Second Derivative Test to verify that your answer produces a maximum.

