

Math 170-004
November 16, 2005

Exam 3 Name _____

This test consists of 100 points spread over 5 pages, none of which is intentionally left blank. Take a few seconds right now to be sure you have all the pages. The point value of each question is to the left of the question number. Show all your work in the space provided. If you run out of room for an answer, continue working on the back of the page. Your answers must be justified by your work.

- (10) 1. Let $f(x) = 2x^3 - 3x^2 - 36x + 3$. Find the absolute maximum and absolute minimum for f on the interval $[-5, 5]$

- (10) 2. Suppose $f'(x) \leq g'(x) \forall x \in [-3, 3]$ and that $f(3) = g(3)$. Use the mean value theorem on the function $h(x) = g(x) - f(x)$ to show that $f(-3) \geq g(-3)$.

- (10) 3. Use the first derivative test to find the local extrema for

$$f(x) = 2x^3 - 3x^2 - 36x + 3$$

- (10) 4. Determine the intervals on which the graph of $f(x) = 2x^3 - 3x^2 - 36x + 3$ is concave up and those on which the graph of f is concave down.

- (10) 5. You are trying to find a solution to $f(x) = 0$ and you decide that $x = 2$ is a good guess. An equation of the tangent to the graph of f at the point $(2, f(2))$ is $y = 3x - 5$. What number would Newton's method have you use as your next guess?
- (15) 6. Find the dimensions of the cylinder of largest volume that can be inscribed in a cone of radius 5 and height 10.

7. Evaluate the following limits

$$(10) \quad (a) \lim_{x \rightarrow \infty} \left(\frac{x+1}{x+2} \right)^x$$

$$(10) \quad (b) \lim_{x \rightarrow 0} \frac{\ln(\sin(x))}{\ln(\tan(x))}$$

- (15) 8. Sketch the graph of

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

Remember, this means you find all extrema, inflection points, asymptotes regions where the function is increasing, decreasing and determine its concavity.