

1st PRACTICE MIDTERM #2

1) Define global maximum and global minimum for a function $f(x)$ on \mathbb{R} .

2) a) State the mean value theorem.

b) Determine if it applies to the function $f(x) = x^{2/3}$ on the interval $[-1, 8]$. Find any $c \in (-1, 8)$ for which the conclusion of the theorem holds.

3) Show the function $f(x) = x^5 + 2x^3 - 2$ crosses the x -axis exactly once in $[0, 1]$. (Hint: Graph it, then explain why it must cross once and can't cross more than once.)

4) A group of Carleton students are to be contained in two holding pens - a square and a circle constructed from 100 ft ^{total} of fence. In order to maximize their discomfort, find the smallest total area which can be thus enclosed.

5) A spherical balloon is inflated at a rate of $50 \text{ in}^3/\text{minute}$. At what rate is the radius increasing when it is 5 inches?

6) Find the tangent line to the curve

$$\sin(x+y) = -y \quad \text{at the point } (0, 0).$$

Practice Midterm #2 essays

- 1) Critical points, the theorem of the interior extremum, optimization
- 2) second derivatives, graphs, reading graphs with first and second derivative information
- 3) Applications of the first derivative (eg, explain density, magnification, population growth, elasticity, margin, etc.), and why these can all be described with derivatives
- 4) Motion, first and second derivatives, constant acceleration and antiderivatives
- 5) The Mean Value Theorem

Sections covered:

3.1—applications of derivative: velocity, density, magnification

3.6—chain rule

4.1—Theorem of the Interior Extremum, Rolle's theorem, Mean Value Theorem, corollaries

4.2—1st derivative and graphing (+old graphing tools)

4.5—2nd derivative and graphing (concave up and down) plus interpreting graphs in terms of applications

4.3—motion and the second derivative—"falling body problems"

4.4—related rates

4.7—optimization