

MATH 115 Calculus for the Biological Sciences

Instructor: Richard Taylor

MIDTERM EXAM #2

17 November 2005 14:30–15:20

Instructions:

- 1. Read all instructions carefully.
- 2. Read the whole exam before beginning.
- 3. Make sure you have all 6 pages.
- 4. Organize and write your solutions neatly.
- 5. You may use the backs of pages for calculations.
- 6. You must clearly show your work to receive full credit.
- 7. You may use a calculator.

PROBLEM	GRADE	OUT OF
1		8
2		6
3		5
4		5
5		6
TOTAL:		30

/8

Problem 1: For the function $f(x) = 3x^5 - 5x^3 + 3$, (a) find the intervals of increase or decrease, and identify the local maxima and minima;

(b) find the intervals of concavity, and identify the inflection points;

(c) use the information from parts (a)-(b) to sketch the graph of y = f(x).



Problem 2: Evaluate the following limits, using L'Hôpital's Rule where appropriate (or, if the limit does not exist, say so).

(a) $\lim_{x \to 1} \frac{\ln x}{\sin(\pi x)}$



Problem 3: Use Newton's method to find one solution of the equation

 $x^4 = 1 + x$

correct to two decimal places.

/5



Problem 4: (a) Find the linear approximation of the function $f(x) = \sqrt[4]{x}$, based at a = 16.

(b) Use your result from part (a) to find the approximate value of $\sqrt[4]{15}$.



Problem 5: If 1200 cm^2 of material is available to make a box with a square base and an open top, what should be the box's dimensions in order to maximize its volume?

17 November 2005