
Friday, April 18, 2008

STUDENT NAME: _____

EXAM III – MATH 135, SPRING 2008

READ EACH PROBLEM CAREFULLY! To get full credit, you must show all work!

The exam has 7 problems on 4 pages! Turn in all pages! NO GRAPHING CALCULATORS ALLOWED!

- **Problem 1.**

The half-life of Cesium-137 is 30 years. Suppose we have a 100-mg sample.

(a) Find the mass that remains after t years.

(b) How much of the sample remains after 100 years?

(c) After how long will only 1 mg remain?

- **Problem 2.**

Use l'Hôpital's Rule to compute the following limits.

(a) $\lim_{x \rightarrow \infty} \frac{x}{e^x} =$

(b) $\lim_{x \rightarrow 0^+} x^2 \ln x =$

(c) $\lim_{x \rightarrow 0} \frac{1 - \cos x}{\sin x} =$
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- **Problem 3.**

Find the local and absolute extreme values of the function on the interval specified.

$$f(x) = \frac{\ln x}{x^2}, \quad x \in [1, e]$$

- **Problem 4.**

Find the maximum value of the function

$$f(x) = x(1 - x), \quad x \in [0, 1]$$

- **Problem 5.**

Find all the inflection points (if any) for the function

$$f(x) = x(x + 1)^3.$$

- **Problem 6.**

Sketch the graph of the function

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

Determine: (1) the domain, (2) symmetries (if any), (3) the critical points, (4) intervals where the function increases or decreases, (5) concavity and inflection points, and (6) limits at infinity. Remember, a sign chart is always of great help!

• **Problem 7.**

Consider the function

$$f(x) = (x^2 - 1)^2.$$

- (a) Find the critical points for f . Find relative maxima and minima points.
- (b) On which intervals(s) is f concave upwards? Are there any inflection points?