
SAMPLE EXAM III – MATH 135, SPRING 2008

No graphing calculators allowed during exams!!!

1. Cobalt-60 has a half-life of 5.24 years.
 - (a) Find the mass that remains from a 100-mg sample after 20 years.
 - (b) How long would it take for the mass to decay to 1 mg?

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

(a) $\lim_{x \rightarrow \infty} \frac{\ln 3x}{x} =$

(b) $\lim_{x \rightarrow 0} \frac{e^{2x} - 1 - 2x}{x^2} =$

(c) $\lim_{x \rightarrow 1} \left(\frac{1}{x-1} - \frac{1}{\ln x} \right) =$

(d) $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^3} =$

(e) $\lim_{x \rightarrow 2} \frac{\sqrt{5+2x}-3}{x-2} =$

3. Find the local and absolute extreme values of the function given in the interval

(a) $f(x) = x^4 - 2x^2 + 3, \quad x \in [-2, 3]$

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

(c) $f(x) = x\sqrt{4-x^2}, \quad x \in [-1, 2]$

4. Find the maximum value of the function

$$f(x) = \sin x + \cos x, \quad x \in [0, \pi]$$

5. Find the inflection points for the function $f(x) = xe^{-2x}$.

6. Let $f(x) = 2 + 3x - x^3$.

(a) Calculate $f'(x)$ and sketch the graph of f' .

(b) Find the critical points for f . Find relative maxima and minima points.

(c) On which intervals(s) is f concave upwards? Are there any inflection points?

7. Sketch the graph of the function

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

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!

8. Sketch the graph of the function $f(x) = x^4 - 2x^2$, indicating the same steps as above.