

Fall 2005 Math 151

Week in Review 8

courtesy: Amy Austin

(covering sections 4.8-5.2)

Section 4.8

1. Find the following limits.

a.) $\lim_{x \rightarrow 1} \frac{\ln x}{x - 1}$

b.) $\lim_{x \rightarrow 0} \frac{\sin x - x}{x^3}$

c.) $\lim_{x \rightarrow \infty} \frac{(\ln x)^3}{x^2}$

d.) $\lim_{x \rightarrow 0^+} x^2 \ln x$

e.) $\lim_{x \rightarrow \infty} (e^x + x)^{\frac{1}{x}}$

f.) $\lim_{x \rightarrow 0} (1 + \sin 4x)^{\cot x}$

g.) $\lim_{x \rightarrow 0} (\sin x)^{\tan x}$

h.) $\lim_{x \rightarrow 1} \left(\frac{1}{\ln x} - \frac{1}{x - 1} \right)$

2. Given the graph of $f'(x)$ on page 306, number 11 and 12 in text book, find intervals if increase/decrease, local extrema, intervals of concavity and inflection points. Given that $f(x)$ is continuous and $f(0) = 0$, sketch a possible graph of $f(x)$

3. Sketch a graph satisfying:

a.) Domain: All real numbers

b.) $f(-1) = -2$, $f(0) = 0$, $f(2) = 3$

c.) $f'(x) < 0$ for $x < -1$ and $x > 2$

d.) $f'(x) > 0$ if $-1 < x < 2$

e.) $f''(x) > 0$ if $x < 0$ and $f''(x) < 0$ if $x > 0$

Section 5.2

4. For the following functions, identify all critical values. Be sure to classify each critical value.

a.) $f(x) = x^4 + 4x^3 + 2$

b.) $f(x) = \frac{2x^2}{x - 4}$

c.) $f(x) = |x^2 - 2x|$

d.) $f(x) = (x^2 - x)^{1/3}$

5. Find the absolute extrema for the following functions by graphing.

a.) $f(x) = 4 - x^2$, $-1 < x \leq 2$

b.) $f(x) = \begin{cases} x^2 & \text{if } -1 \leq x < 0 \\ 2 - x^2 & \text{if } 0 \leq x \leq 1 \end{cases}$

6. Find the absolute extrema for:

a.) $f(x) = x^3 - 12x + 1$ over the interval $[-1, 5]$

b.) $f(x) = x \ln x$ over the interval $[1, 3]$

7. Sketch a graph of a function satisfying the following conditions:

a.) $x = 2$ is a critical number, but $f(x)$ has no local extrema.

b.) $f(x)$ is a continuous function with a local maximum at $x = 2$, but $f(x)$ is not differentiable at $x = 2$.