**MATH 1120** **Test 2** **Spring 2009**

Name : _____

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1. Let $f(x) = \frac{2}{3}x^3 - 2x^2 - 6x - 2$.

   (a) Find the interval(s) where $f(x)$ is increasing and the interval(s) on which it is decreasing.

   (b) Find the relative maxima and relative minima, if any.

2. Find the absolute maximum and the absolute minimum of

$$f(x) = 8 - (x-1)^{2/3}$$

   on the interval $[0, 9]$.

3. Let $f(x) = \dfrac{x-1}{x+1}$. Find the interval(s) where $f(x)$ is concave upward, and the interval(s) on which it is concave downward.

4. For a function $f(x)$, we have the information below. Sketch the graph of the function $f$:

| | |
|---|---|
| Domain: | $(-\infty, 0) \cup (0, \infty)$ |
| Asymptotes: | x-axis and y-axis |
| Intervals where $f$ is $\nearrow$ and $\searrow$: | $\nearrow$ on $(0, 2)$; |
| | $\searrow$ on $(-\infty, 0) \cup (2, \infty)$ |
| Relative extrema: | Relative max. at $(2, 1)$ |
| Concavity: | Downward on $(-\infty, 0) \cup (0, 3)$; |
| | upward on $(3, \infty)$ |
| Points of inflection: | $(3, \frac{8}{9})$ |

5. A person has 4000 yd of fencing material with which to enclose a rectangular a rectangular piece of grazing land along a stright portion of a river and then subdivide it by means of two fences running parallel to the sides. No fencing is required along the river. What are the dimensions of the largest area that can be enclsoed? What is this area?

6. Solve the equations for $x$:

   (a) $2^x = 4^{x-3}$

   (b) $3e^{2x} = 20$

7. (a) Compute the future value after 10 years on \$4000 invested at 6% interest compounded continuously.

   (b) A man invested a sum of money 4 years ago in a saving account, which has since paid interest at the rate of 7% compounded monthly. His investment is now worth \$26441.08. How much did he originally invest.

8. Find the derivatives of the following functions

(a) $e^x + \ln x$

(b) $\ln(x^2 + 4)$

(c) $e^{-3x}$

(d) $\dfrac{e^x}{e^x + 1}$

(e) $x^2 \ln(3x + 1)$

(f) $x^3 e^{x^4}$

(g) $e^{-\sqrt{x}} \ln \sqrt{x^3 + 1}$

(h) $\dfrac{e^{2x+1}}{\ln(3x^2 + 1)}$