

Exam 3

Name: _____

Math 125.01
April 15, 2008

Question	Points Earned	Points Possible
1		10
2		10
3		10
4		10
5		12
6		5
7		10
8		10
		10
Bonus		
Total		85

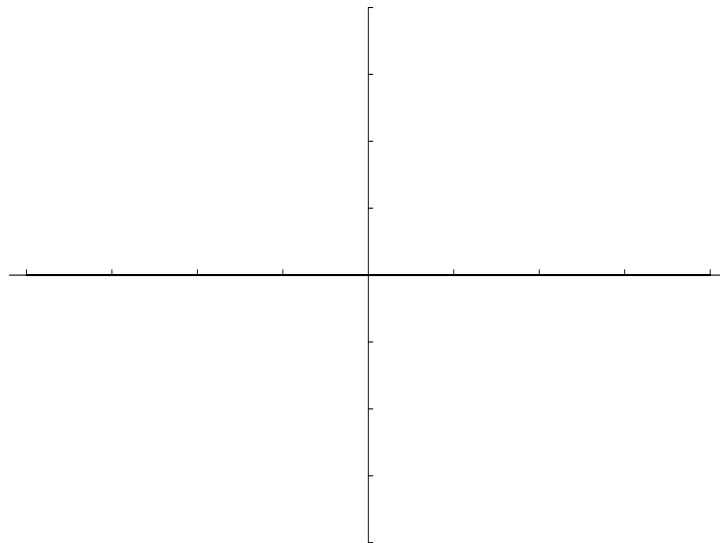
1. Given the function $f(x) = x^4 - 18x^2 + 30$, determine the following:
 - (a) The intervals on which $f(x)$ is increasing and those on which $f(x)$ is decreasing.

 - (b) Local extreme points (Label which are local max's and which are local min's).

 - (c) The intervals on which the graph is concave upward/downward.

 - (d) Point(s) of inflection.

 - (e) Sketch the curve. (Be sure to scale your axes or label important points)



2. Given the function $f(x) = e^{-x^2/2}$, determine the following:

(a) The intervals on which $f(x)$ is increasing and those on which $f(x)$ is decreasing.

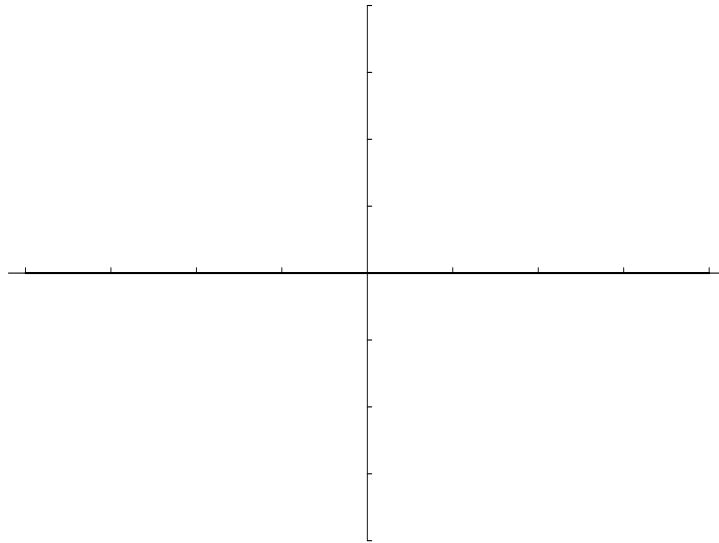
(b) Local extreme points (Label which are local max's and which are local min's).

(c) The intervals on which the graph is concave upward/downward.

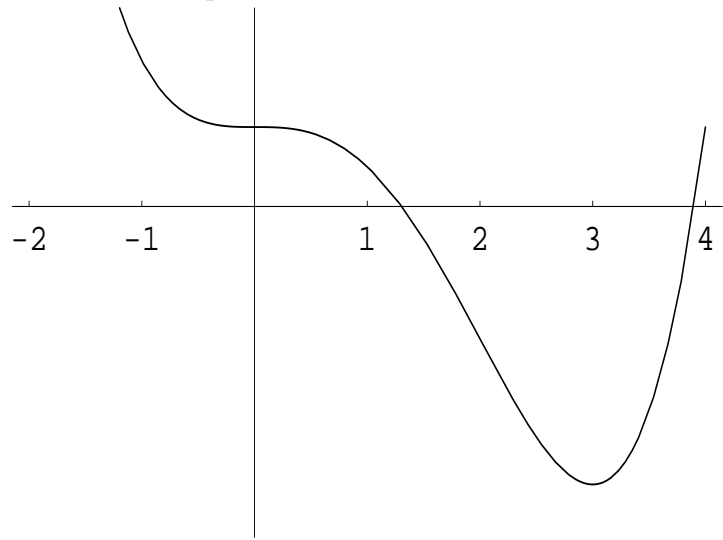
(d) Point(s) of inflection.

(e) Asymptotes (horizontal and vertical) and intercepts (x -intercepts and y -intercepts)

(f) Sketch the curve. (Be sure to scale your axes or label important points)



3. Using the graph of $f(x)$ below, determine if $f(x)$, $f'(x)$, and $f''(x)$ are positive, negative, or zero at each marked point.



	$f(x)$	$f'(x)$	$f''(x)$
A			
B			
C			
D			
E			

4. State the Mean Value Theorem.
 (Be sure to include both the hypotheses and the conclusion, as well as a sketch that illustrates the theorem.)

5. Find the following limits.

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

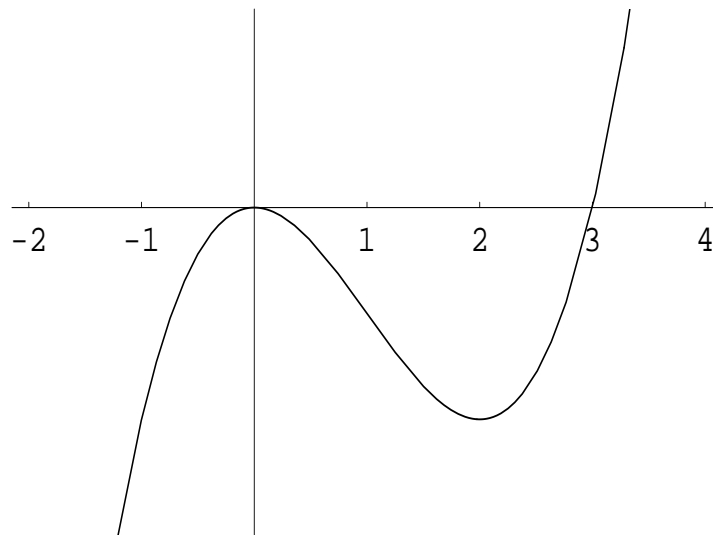
(b) $\lim_{x \rightarrow -3} \frac{x^2 - 9}{3 - x}$

(c) $\lim_{\theta \rightarrow 0} \frac{\cos \theta - 1}{3e^\theta - 3\theta - 3}$

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

6. Find the absolute maximum and minimum values of $f(x) = e^x - 3x$ on $[0, 2]$.

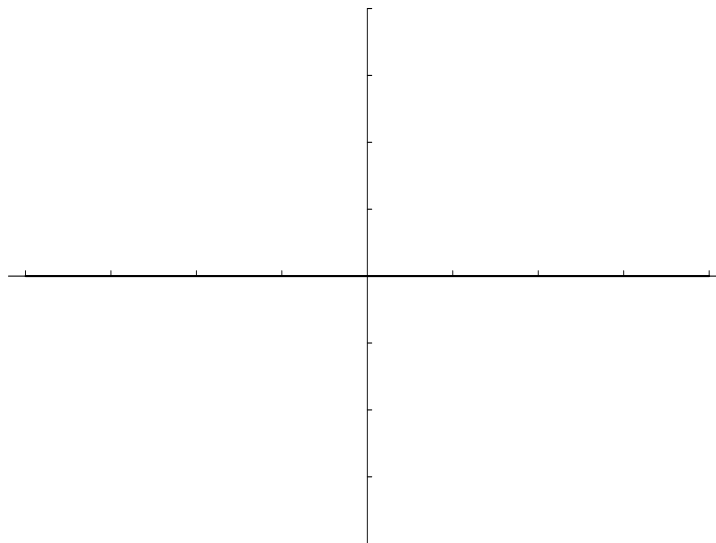
7. The figure below shows the graph of the derivative, $f'(x)$, of a function $f(x)$.



(a) On what intervals is $f(x)$ increasing or decreasing?

(b) On what intervals is $f(x)$ concave upward or concave downward?

(c) Sketch a possible graph of $f(x)$, noting where local extrema and points of inflection occur.



8. Answer **2** of the following **3** optimization problems. If you do not **clearly** mark which **2** that you wish to have graded, I will grade the first 2.

(a) You are designing a rectangular poster to contain 50 in.^2 of printing with a 4-in. margin at the top and bottom and a 2-in. margin at each side. What dimensions of the printed area will minimize the amount of paper used?

(b) A landscape architect plans to enclose a 3000 square foot rectangular region in a botanical garden. She will use shrubs costing \$20 per foot along three sides and fencing costing \$15 per foot along the fourth side. Find the minimum total cost.

- (c) Find the area of the largest rectangle that can be inscribed in a right triangle with legs of lengths 6 cm and 8 cm if two sides of the rectangle lie along the legs.

Bonus:

Determine $\lim_{x \rightarrow \infty} \frac{\sqrt{x+7}}{\sqrt{x+7}}$