

- (8) 1. A point is moving along the graph of the function $y = \sin x$ so that $\frac{dx}{dt}$ is 2 centimeters per second. Find y and $\frac{dy}{dt}$ when $x = \frac{\pi}{6}$.

$$y = \underline{\hspace{10cm}}$$

$$\frac{dy}{dt} = \underline{\hspace{10cm}}$$

- (10) 2. Find the indicated limits. Give evidence to support your answers.

a) $\lim_{x \rightarrow +\infty} \frac{3x + 2}{2x - 1}$

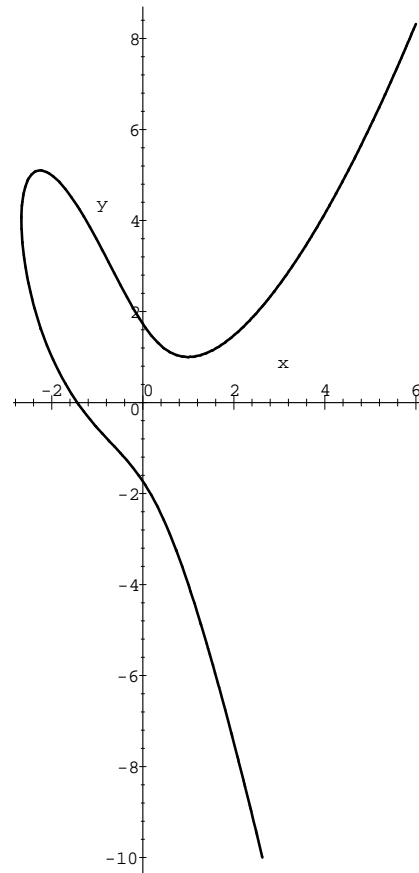
b) $\lim_{x \rightarrow \frac{1}{2}^+} \frac{3x + 2}{2x - 1}$

- (12) 3. Find all relative maximum and minimum values of the function $f(x) = (x^2 - 3)e^x$. Briefly explain your answers using calculus.

- (14) 4. The program **Maple** displays this image when asked to graph the equation

$$y^2 = x^3 - 3xy + 3.$$

- a) Verify by substitution that the point $P = (-2, 1)$ is on the graph of the equation.



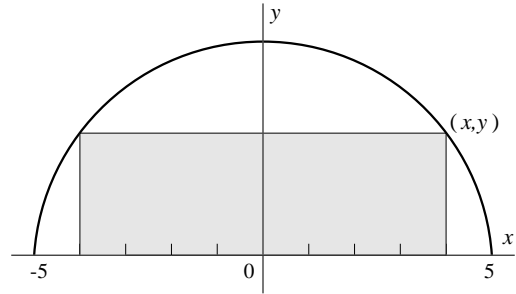
- b) Find $\frac{dy}{dx}$ in terms of y and x .

- c) Find an equation for the line tangent to the graph at the point $P = (-2, 1)$.

- d) Sketch this tangent line in the appropriate place on the image displayed.

- (16) 5. A rectangle is bounded by the x -axis and the semicircle $y = \sqrt{25 - x^2}$ (see figure). What length and width should the rectangle have so that its area is a maximum?

Briefly explain using calculus why your answer gives a maximum.



(20) 6. Suppose $W(x) = -\frac{1}{2}x^2 + 6x - 5 \ln x$.

a) Compute $W'(x)$ and $W''(x)$. Where are these functions equal to 0?

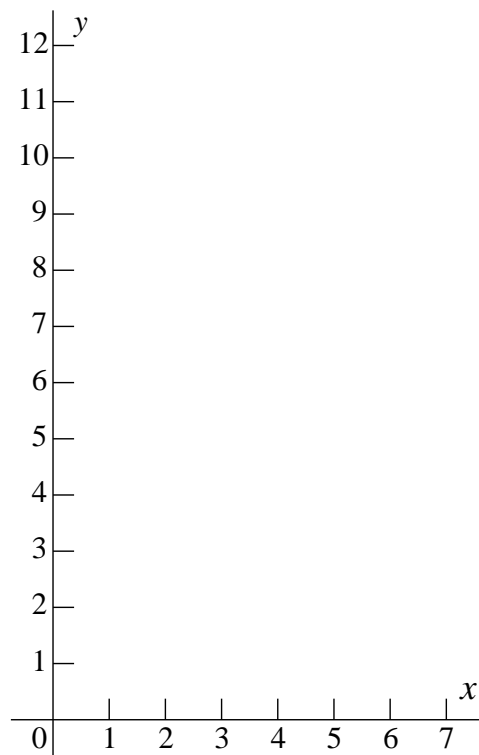
b) What is $\lim_{x \rightarrow 0^+} W(x)$? **ANSWER** _____

c) Sketch a graph on the axes given of $y = W(x)$ for x between 0 and 7.

• Label any relative maxima with an **M** on your graph.

• Label any relative minima with an **m** on your graph.

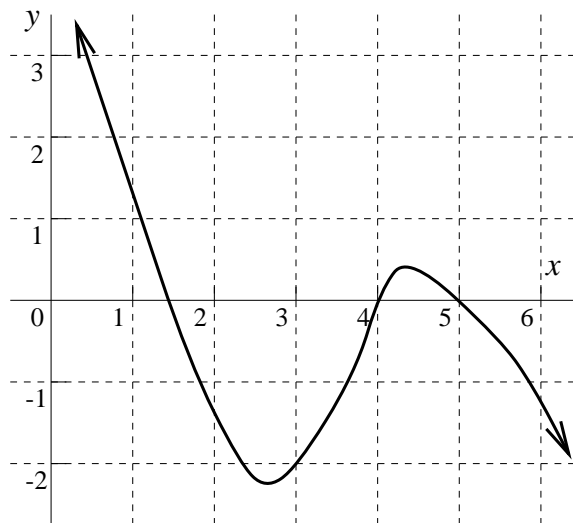
• Label any points of inflection with an **I** on your graph.



• In what interval(s) on this graph is $W(x)$ $\left\{ \begin{array}{l} \text{increasing? ANSWER } \underline{\hspace{2cm}} \\ \text{decreasing? ANSWER } \underline{\hspace{2cm}} \\ \text{concave up? ANSWER } \underline{\hspace{2cm}} \\ \text{concave down? ANSWER } \underline{\hspace{2cm}} \end{array} \right.$

- (20) 7. To the right is a graph of $h'(x)$, the *derivative* of a function, h . Use this graph to answer the questions below.

a) Use information from the graph of $h'(x)$ to find the x where the *maximum value* of h in the interval $1 \leq x \leq 3$ will occur. Briefly explain using calculus why your answer is correct, including verification that the value of h at the x you select is larger than h 's value at *any* other number in the interval.



The graph of $h'(x)$, the *derivative* of $h(x)$

b) Suppose that $h(3) = 5$. Use information from the graph and the differential or tangent line approximation to find an approximate value of $h(3.04)$. Briefly explain using calculus and information from the graph why your approximation for $h(3.04)$ is greater than or less than the exact value of $h(3.04)$.

B**B****Exam 2 for Math 135****Sections 8, 9, and 10**

April 13, 1999

NAME (*please print*): _____

SIGNATURE: _____

SECTION #: _____

Do all problems, in any order.**Show all your work. Full credit may not be given for an answer alone.****You may use one sheet of notes and any standard calculator without a QWERTY keypad on this exam. You may use no other materials.**

Problem Number	Possible Points	Points Earned:
1	8	
2	10	
3	12	
4	14	
5	16	
6	20	
7	20	
Total Points Earned:		

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