1 B

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

$y =$ ____________________

$\dfrac{dy}{dt} =$ ____________________

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

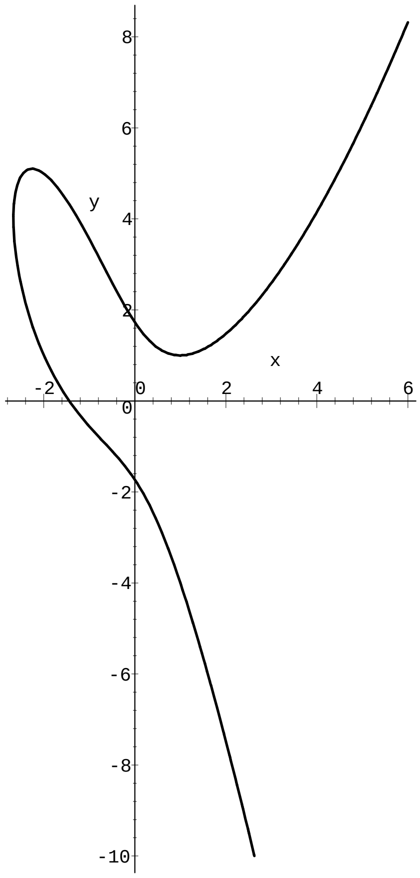
a) $\displaystyle\lim_{x \to +\infty} \frac{3x+2}{2x-1}$

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

(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.

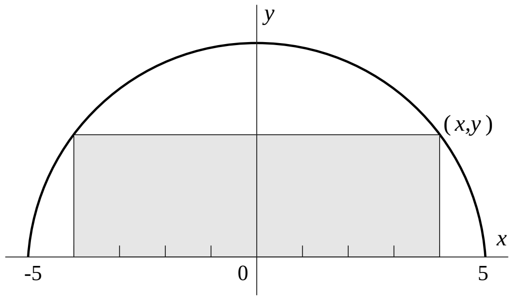
b) Find $\dfrac{dy}{dx}$ in terms of y and x.

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.



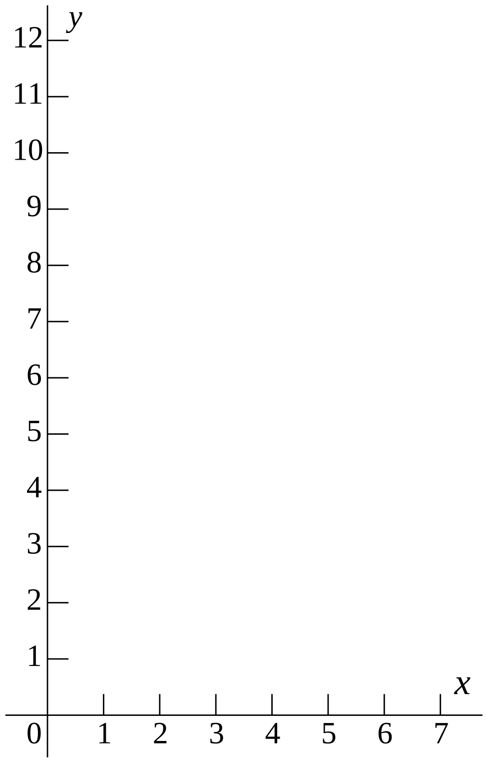
(20) 6. Suppose $W(x) = -\frac{1}{2}x^2 + 6x - 5\ln x$.

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

b) What is $\lim\limits_{x \to 0^+} W(x)$? **ANSWER** ______________________

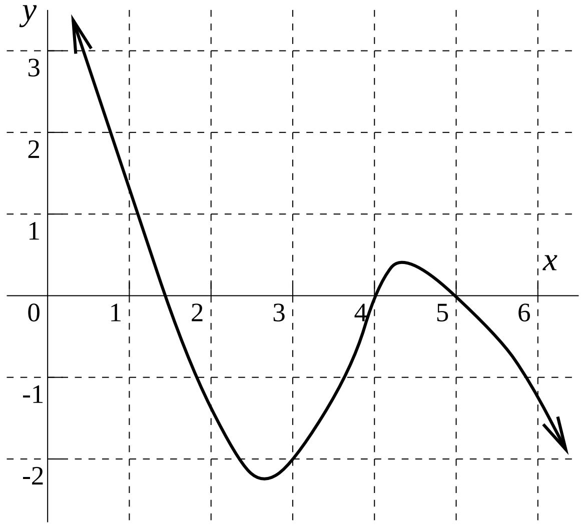
c) Sketch a graph on the axes given of $y = W(x)$ for x between 0 and 7.

- 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 $W(x)$
  - increasing? **ANSWER** ______________________
  - decreasing? **ANSWER** ______________________
  - concave up? **ANSWER** ______________________
  - concave down? **ANSWER** ______________________

(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.



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

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.

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 <u>one</u> sheet of notes and any standard calculator without a QWERTY keypad on this exam. You may use <u>no</u> 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:		

B **B**