

MATH 112 B
Exam I - Version 1
April 24, 2003

Name _____

Student ID # _____

Section _____

1	16	
2	16	
3	18	
Total	50	

- You are allowed to use a calculator, a ruler, and one sheet of handwritten notes.
- You must show your work on all problems. The correct answer with no supporting work may result in no credit.
- Write your answers in the specified locations.
- If you need more room, use the backs of the pages and indicate to the reader that you have done so. If you still need more paper, please ask for some.
- When rounding is necessary, round your **final answer** to two digits after the decimal.
- Raise your hand if you have a question.
- Put your name on your sheet of notes and turn it in with the exam.
- You have 50 minutes to complete the exam.

GOOD LUCK!

1. (16 points) Let $f(x) = x^2 - 4x + 5$.

- (a) Use the derivative rules to compute $f'(x)$ and find the slope of the tangent line to $f(x)$ at $x = 3$.

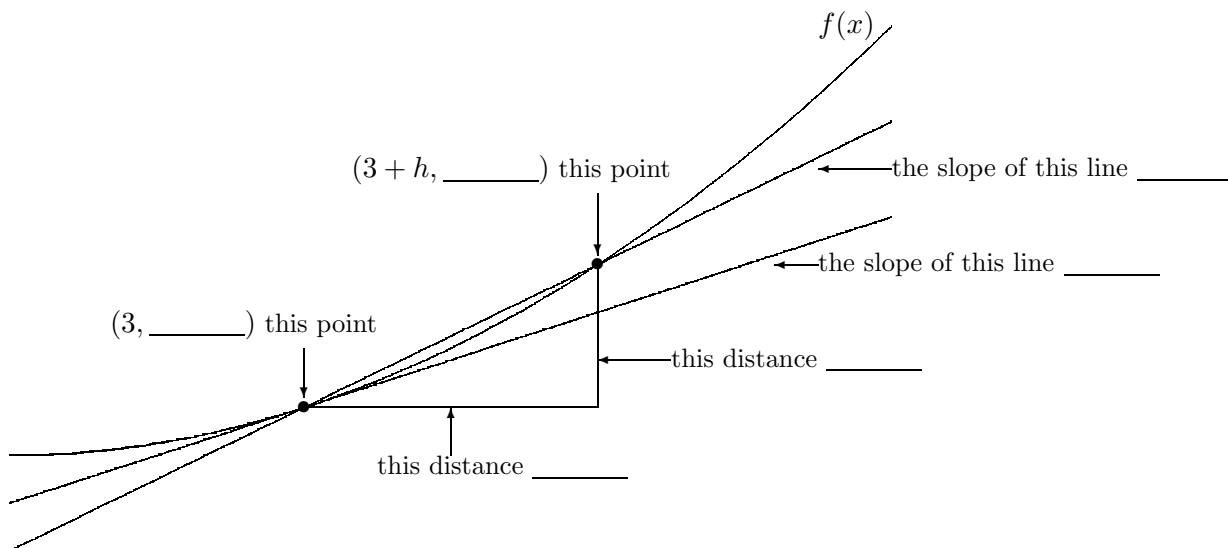
ANSWERS: $f'(x) = \underline{\hspace{2cm}}$
 slope = $\underline{\hspace{2cm}}$

- (b) Compute $\frac{f(3+h) - f(3)}{h}$, the slope of the secant line to $f(x)$ from $x = 3$ to $x = 3 + h$. Simplify your answer so that it is in the form $(\quad)h^2 + (\quad)h + (\quad)$.

ANSWER: $\frac{f(3+h) - f(3)}{h} = (\quad)h^2 + (\quad)h + (\quad)$

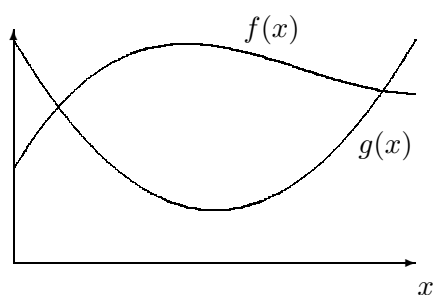
- (c) Choose from the following list to fill in the blanks below.

- (i) h (ii) $f(3)$ (iii) $f'(3)$
 (iv) $f(3+h)$ (v) $f(3+h) - f(3)$ (vi) $\frac{f(3+h) - f(3)}{h}$



2. (16 points) The graphs below are the graphs of two functions:

$$f(x) = \frac{1}{3}x^3 - 5x^2 + 21x + 20 \quad \text{and} \quad g(x) = 3x^2 - 21x + 48.$$



(a) Find the value of x at which $g'(x)$ is equal to 42.

ANSWER: $x =$ _____

(b) Find the value of x at which the derived graph of $f(x)$ reaches its lowest value.

ANSWER: $x =$ _____

(c) Find all values of x at which the function $f(x)$ has a horizontal tangent line.

ANSWER: $x =$ _____

(d) Give the longest interval over which $f(x)$ and $g(x)$ are both decreasing.

ANSWER: from $x =$ _____ to $x =$ _____

3. (18 points) You manufacture alarm clocks. The Total Cost is given by a function $C(q)$, where q is measured in hundreds of clocks and Total Cost is measured in hundreds of dollars. We do not know the formula for $C(q)$, but we do know the formula for the slope of a secant line from $q = q_1$ to $q = q_2$:

$$\frac{C(q_2) - C(q_1)}{q_2 - q_1} = \frac{3}{2}q_1 + \frac{3}{2}q_2 + 9.$$

- (a) Compute the slope of the secant line to TC from $q = 5$ to $q = 11$.

ANSWER: slope = _____

- (b) Find the increase in Total Cost that comes with changing quantity from 4 hundred clocks to 7 hundred clocks.

ANSWER: increase = _____ hundred dollars

- (c) Find a formula for $\frac{C(m+h) - C(m)}{h}$, the slope of the secant line from $q = m$ to $q = m + h$.

ANSWER: $\frac{C(m+h) - C(m)}{h} =$ _____

- (d) Find a formula for $C'(m)$, the Marginal Cost at m hundred clocks and use this formula to estimate the cost of the 201st clock.

ANSWERS: $C'(m) =$ _____

cost of 201st clock = _____ dollars