MATHEMATICS Xa

First Examination

October 31, 1995

The first seven questions are relatively short answer. On the remaining three you must show all your work and explain your reasoning in order to receive full credit. Use your time wisely.

Please think clearly and do well!

Problem	Points	Score
1	5	
2	10	
3	12	
4	12	
5	10	
6	12	
7	5	
8	12	
9	12	
10	10	
Total	100	

Math • CONVERTING FEET TO METERS

1. (5 points) Suppose f is a function of an independent variable x. Which **one** of the following describes the output of the function f ' ? Please read all the choices very carefully.

    a) the output of f ' associates to x the tangent line to f.

    b) the output of f ' associates to x the average rate of change of f from x to x+h.

    c) the output of f ' associates to x the slope of the tangent line to f.

    d) the output of f ' associates to x the height of f.

2. (10 points) A person deposits \$2000 in a bank account that pays nominal interest rate of 8% per year, compounded quarterly. No further deposits or withdrawals are made.

    i) Find A(t), the total amount of money in the account at time t, where t is the number of years from the time of the original deposit.

    ii) Find A(m), the total amount of money in the account at time m, where m is the number of months from the time of the original deposit.

3. (12 points) Below is a graph of f(x).
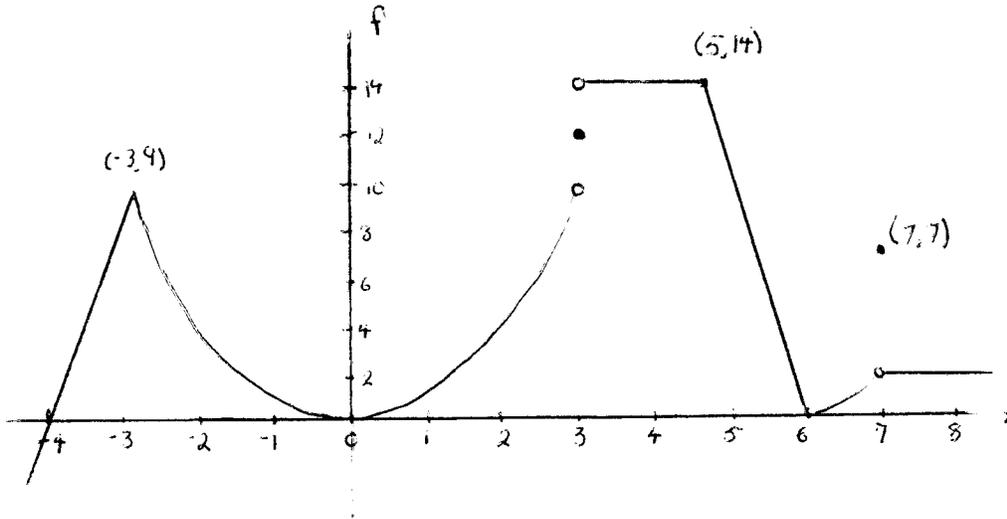
i). Find the following: (Please read carefully and see when we ask about f and when we ask about f')

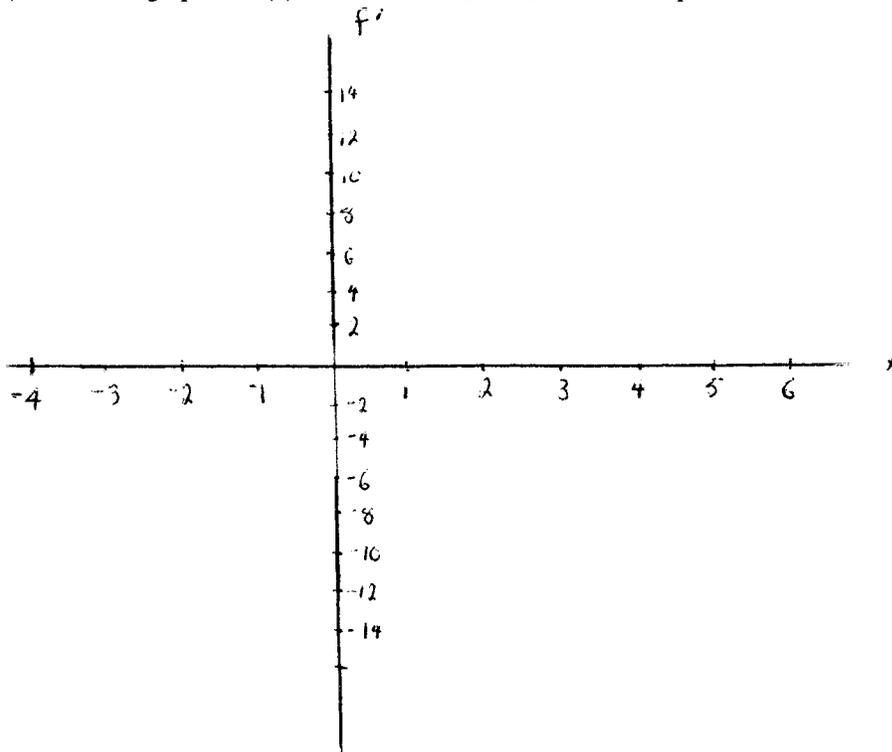a) $\lim\limits_{x \to 7^+} f(x)$

b) $\lim\limits_{x \to 7} f(x)$
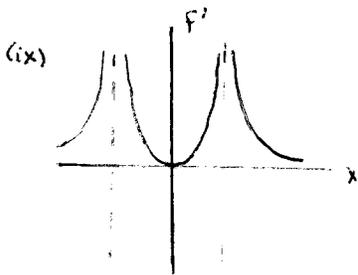
c) $\lim\limits_{x \to 3} f(x)$

d) $f'(5.5)$

e) $\lim\limits_{h \to 0^-} \dfrac{f(5+h) - f(5)}{h}$

f) $\lim\limits_{h \to 0^+} \dfrac{f(5+h) - f(5)}{h}$

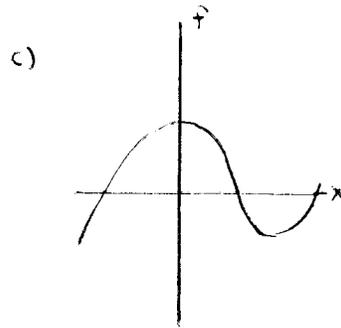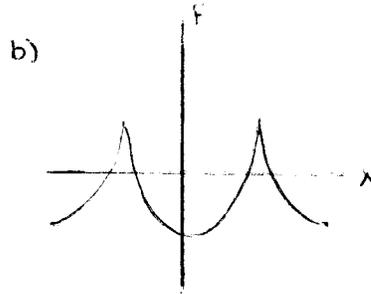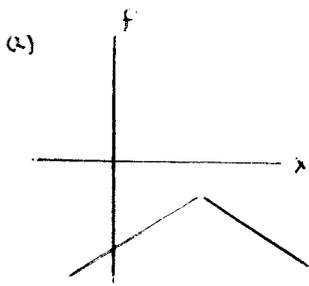ii) Sketch the graph of f '(x) on the domain [-4, 6] on the axes provided below.

4. (12 points) For each of the functions graphed in (a) - (d), determine which one of the graphs i - xii could be the graph of its derivative.

(a)

b)

c)

d)

(i)

(ii)

(iii)

(iv)

(v)

(vi)

(vii)

(viii)

(ix)

(x)

(xi)

(xii)
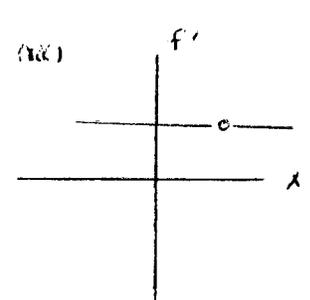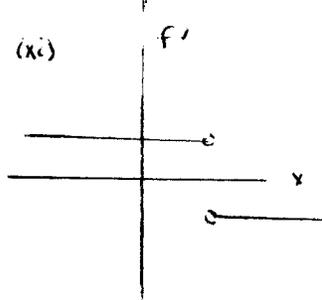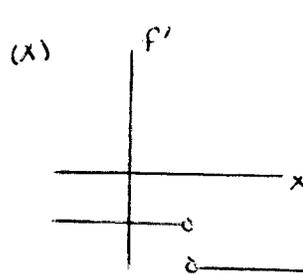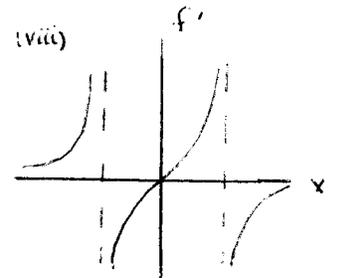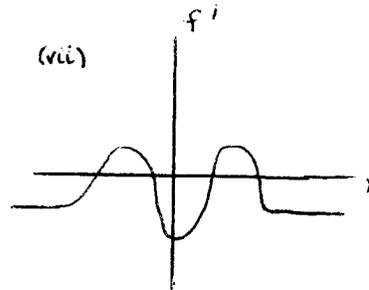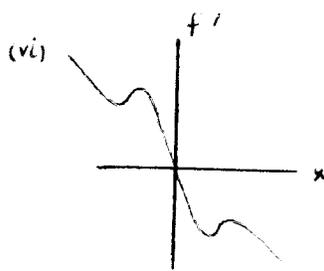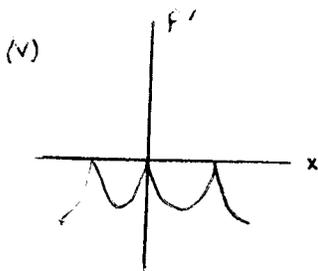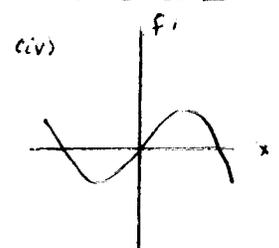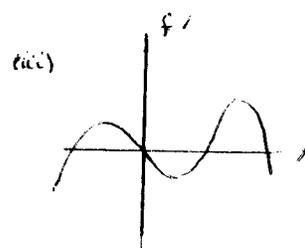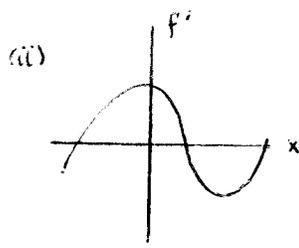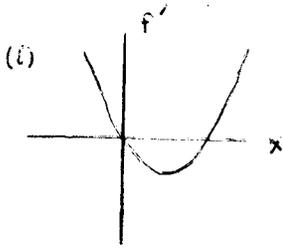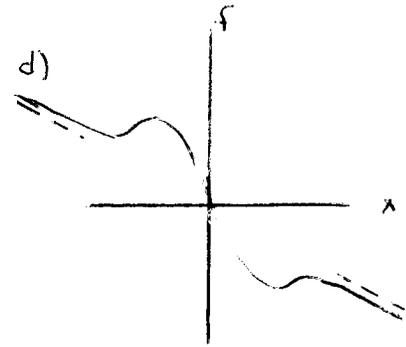
Answers: Graph a) has derivative graph _____

Graph b) has derivative graph _____

Graph c) has derivative graph _____

Graph d) has derivative graph _____

5. (10 points) Suppose P(t) gives the population of a certain colony of ants at time t.

Below is a graph of P ' (*NOT* of P !)
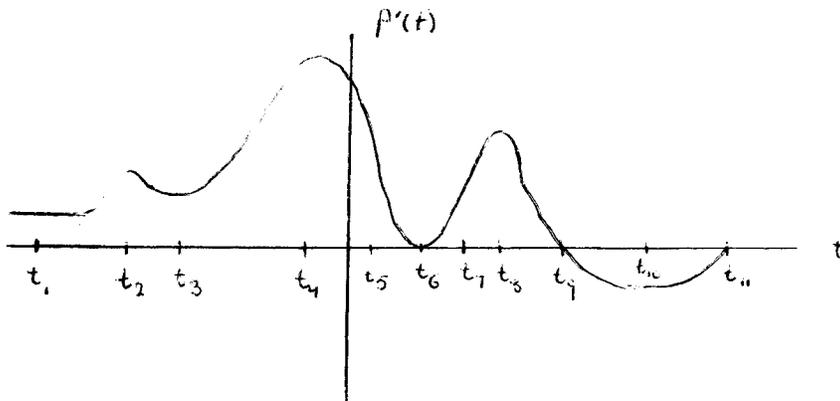
i) At which point labeled is the population of ants greatest? _____

ii) At which point labeled is the population of ants increasing most rapidly? _____

iii) At which point labeled is the population of ants dropping most rapidly? _____

iv) At which point(s) labeled does the graph of P(t), (not P ') have a horizontal tangent line?

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