

Test 2B, Math 152

2007

Name: _____

PID Number: _____

I pledge that I have neither given nor received any unauthorized assistance on this exam.

(signature)

DIRECTIONS

1. Show all of your work. A correct answer with insufficient work will be counted wrong.
2. Clearly indicate your answer by putting a box around it.
3. Calculators are allowed on this exam, but NOT cell phones or laptops.
4. Give all answers in exact form, not decimal form (that is, put π instead of 3.1415, $\sqrt{2}$ instead of 1.414, etc) unless otherwise stated.
5. Make sure you sign the pledge and write your PID on both pages.

PID Number: _____

1. (12 points) A projectile is shot into the air so that its height above the ground after t seconds is given by

$$h(t) = -10t^2 + 220t + 24$$

(a) At what value of t does the projectile reach maximum height?

(b) What is the maximum height reached?

2. (12 points) Given that $A = 1000(1 + \frac{r}{12})^{48}$. This formula for A tells us the dollar value, after 4 years, of an account with an initial deposit of 1000 dollars and interest compounded monthly at the interest rate r . Suppose that the current rate is 5%; that is, $r = 0.05$. Use differentials to approximate the change in value of such an account if r were to increase from its current level to 0.052. Round your final answer to the nearest hundredth.

3. (16 points) You are given that $g(x) = \frac{x^2}{3(x^2+27)}$, $g'(x) = \frac{18x}{(x^2+27)^2}$,
 $g''(x) = \frac{-54(x^2-9)}{(x^2+27)^3}$. Use calculus to answer the following questions:

(a) Does the graph of g have a local maximum or minimum? If so, what are its coordinates?

(b) On what interval(s) is g increasing?

(c) On what interval(s) (if any) is the graph of g concave downward?

(d) On what interval(s) (if any) is the graph of g concave upward?

(e) Find the (x, y) -coordinates of each point of inflection for g . Answers *must* be written as ordered pairs.

4. (12 points) An apple orchard has an average yield of 90 apples per tree if tree density is 20 trees/acre. For each unit increase in tree density (i.e. increase of one tree/acre), the yield decreases by 2 apples. Use calculus to determine how many trees should be planted to maximize the yield. Use the first or second derivative test (whichever you find appropriate) to verify that the apple yield is maximized.

5. (12 points) Find all vertical and horizontal asymptotes, if any, for the given functions:

(a) $f(x) = \frac{x^3}{x+2}$

(b) $f(x) = \frac{6x^2+5x}{5x^2-125}$

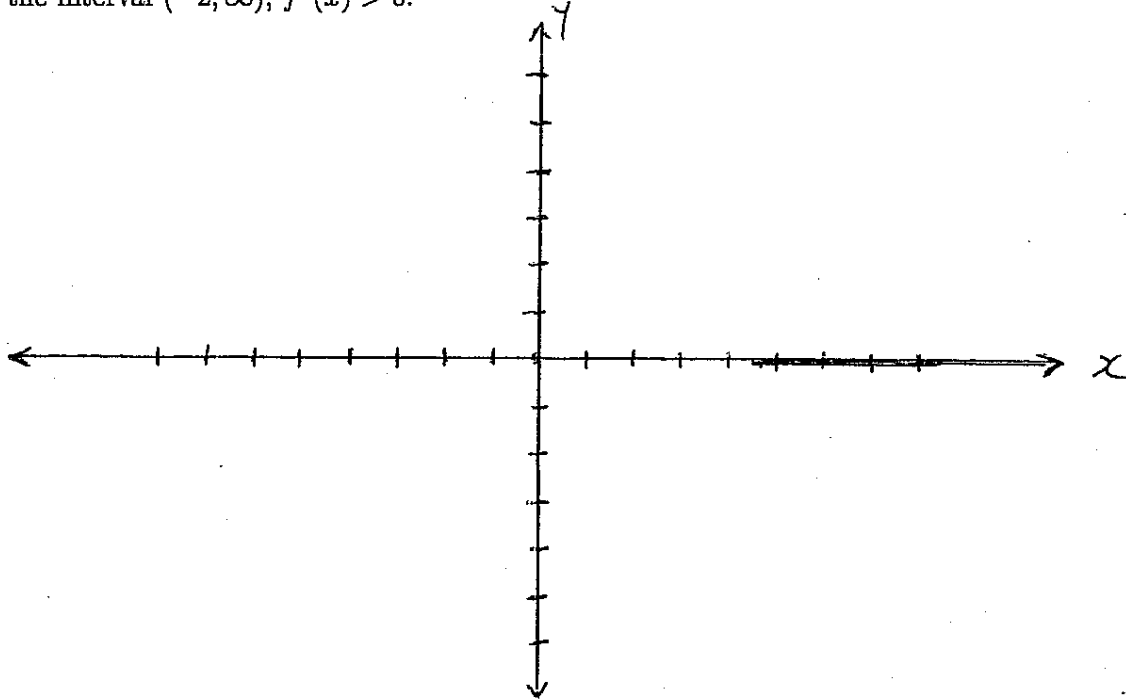
6. (12 points) Sketch the graph of a continuous function f that has all of the following characteristics:

(a) $(-2, 0)$ and $(1, 0)$ are the only x -intercepts

(b) $\lim_{x \rightarrow -\infty} f(x) = 2$ and $\lim_{x \rightarrow \infty} f(x) = \infty$

(c) On the interval $(-\infty, -3)$, $f'(x) > 0$. On the interval $(-3, -1)$, $f'(x) < 0$. On the interval $(-1, \infty)$, $f'(x) > 0$

(d) On the interval $(-\infty, -4)$, $f''(x) > 0$. On the interval $(-4, -2)$, $f''(x) < 0$. On the interval $(-2, \infty)$, $f''(x) > 0$.



7. (12 points) Use calculus to find the absolute maximum and absolute minimum values of $F(t) = t^3 - 243t$ on the interval $[-5, 15]$.

absolute maximum is _____ when $t =$ _____

absolute minimum is _____ when $t =$ _____

8. (12 points) The distance $d(t)$ covered by a car after t seconds is given by

$$d(t) = -2t^3 + 18t^2 - 4t.$$

At what value of t does the car change from accelerating to decelerating?