

MATH 112 C
Exam II - Version 1
February 26, 2004

Name _____

Student ID # _____

Section _____

1	16	
2	17	
3	17	
Total	50	

- You are allowed to use a calculator, a ruler, and one sheet of handwritten notes.
- Please check that your exam contains three problems on three pages.
- Please turn your cell phone OFF and put it away for the duration of the exam.
- You must show your work. 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)

(a) Compute the indicated partial derivative. Do not simplify.

i. $f(x, y) = 2xy^5 + 3x^2y + x^2$

$$f_y(x, y) =$$

ii. $E(b, m) = b^2 + 40m^2 + 25bm - 9b - 16m + 2501$

$$\frac{\partial E}{\partial b} =$$

$$\frac{\partial E}{\partial m} =$$

iii. $w = \frac{(s^2t^4 - 5st)^9}{7st^5 - e^{st}}$

$$\frac{\partial w}{\partial t} =$$

(b) The population of a bacteria colony at time t is given by $P(t)$. You compute the best-fitting line for $\ln(P(t))$:

$$\ln(P(t)) = 0.02t + 3.$$

Find an exponential formula in the form $P(t) = Be^{mt}$ for the population $P(t)$.

ANSWER: $P(t) =$ _____

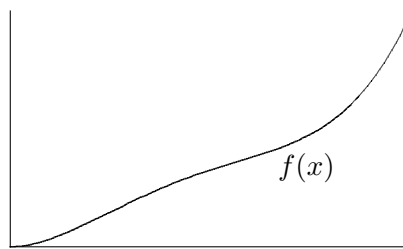
2. (17 points)

The graph to the right is of the function

$$y = f(x) = 2x^4 - 19.5x^3 + 60x^2.$$

We use this graph to define a new function

$$D(x) = \frac{f(x)}{x} = \text{slope of diagonal to } f(x).$$



(a) Write out the formulas for the functions $D(x)$, $D'(x)$, and $D''(x)$.

$$D(x) = \underline{\hspace{10cm}}$$

$$D'(x) = \underline{\hspace{10cm}}$$

$$D''(x) = \underline{\hspace{10cm}}$$

(b) Find the two values of x at which the graph of $D(x)$ has a horizontal tangent. Use the Second Derivative Test to determine whether $D(x)$ reaches a local maximum or a local minimum there.

ANSWER: $x = \underline{\hspace{2cm}}$ gives a local $\underline{\hspace{2cm}}$ of $D(x)$;

$x = \underline{\hspace{2cm}}$ gives a local $\underline{\hspace{2cm}}$ of $D(x)$.

(c) Find the smallest value of $D(x)$ on the interval from $x = 1$ to $x = 3$. As always, you must show your work or justify your answer in some way.

ANSWER: $\underline{\hspace{10cm}}$

(d) Define a new function $T(x) = \text{slope of the tangent line to } f(x)$. Find all values of x at which $T''(x) = 0$.

ANSWER: $x = \underline{\hspace{10cm}}$

3. (17 points) You manage an ice cream factory that makes two flavors: Cherry Vanilla Swirl and Mocha Almond Fudge. Each quart of Cherry Vanilla Swirl requires 2 eggs and 3 cups of cream. Each quart of Mocha Almond Fudge requires 1 egg and 3 cups of cream. You have in stock 500 eggs and 900 cups of cream. You make a profit of \$3 per quart for Cherry Vanilla Swirl and \$2 per quart for Mocha Almond Fudge.

Let x be the number of quarts of Cherry Vanilla Swirl you make and y be the number of quarts of Mocha Almond Fudge. Use the method of linear programming to determine the values of x and y that maximize your profit. What is your maximum profit?

ANSWER: $x =$ _____, $y =$ _____

max profit = \$ _____