Math 285
Final Exam, May 9, 2005

Name: _____

SUID No.: _____

CIRCLE your Instructors Name: Owour Salamy Wortman

PLEASE READ:

1. Place all your work on these sheets. Do not add any sheets to this exam.
2. You may use a TI-83 on this exam. You may NOT use any other calculator nor may you use another student's calculator.
3. **Answers without supporting work/reasons will receive no credit.** Label answers and give units when appropriate.
4. There are 10 problems (with parts) and 12 pages to this exam including this cover page and a blank page for scratch work. Be sure that you have all pages - check NOW! PLEASE put your name on each page in case your exam booklet comes apart.

.....

PLEASE DO NOT WRITE BELOW

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Total _____

NAME.....

1. (10 points) A bank offers an account that pays 2.75% interest per year, compounded continuously. A customer puts $50,000 in the account.

(a). (4 points) How much will be in the customer's account after 6 years? Give answer to the nearest cent.

(b). (6 points) How long will it take for the customer's account to double? Give answer to the nearest tenth of a year.

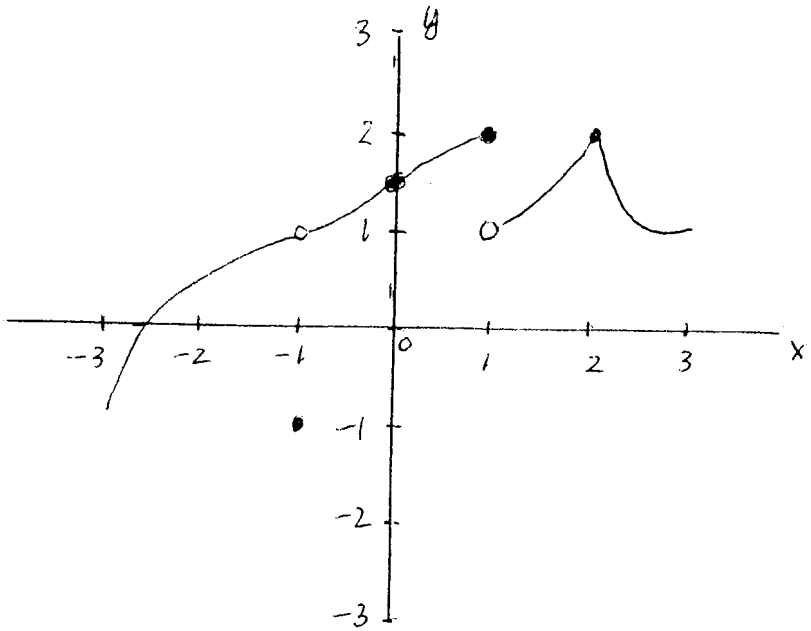
2. (6 points) At a local record shop, the number of CD's sold on day x of the year is given by: $S(x) = 50 + 10\sin(\frac{\pi}{365}x + 10)$.

(a). (3 points) Find the period, amplitude, vertical shift (that is, midline) of $S(x)$.

(b). (3 points) Find the number of CD's sold on day 180. Give answer to the nearest integer.

NAME.....

3. (8 points) The graph of the function $f(x)$ is pictured below.



(a). (4 points) Using the above picture, find the following limits (if a limit does not exist, then write DNE):

$\lim_{x \to 1^+} f(x) =$ $\lim_{x \to 1} f(x) =$

$\lim_{x \to -1} f(x) =$ $\lim_{x \to 2} f(x) =$

(b). (2 points) Circle the points where $f(x)$ is continuous: -1 0 1 2.

(c). (2 points) Circle the points where $f(x)$ is differentiable: -1 0 1 2.

NAME.....

4. (16 points) For the following fuctions, find the indicated derivative (do not simplify):

(a). (4 points) $f(x) = x^{\frac{4}{3}} + \dfrac{1}{x^2} + \ln(x) + e^{x^4 - 2x^3}$, $\qquad f'(x) =$

(b). (4 points) $h(x) = \sqrt{x^4 + \cot(3x)}$, $\qquad h'(x) =$

(c). (4 points) $w(z) = \dfrac{z^3 + 3}{\ln(z)}$ $\qquad w'(z) =$

NAME.....

(d). (4 points) $s(t) = \sin(t^3)$ $s''(t) =$

5. (8 points) The position (in meters) of a particle moving along a line is given by: $d(t) = -t^5 + 3t - 16$, where t is in minutes.

(a). (4 points) Find the velocity when $t = 3.5$ minutes. Give units for answer.

(b). (4 points) Find the acceleration when $t = 1.5$ minutes. Give units for answer.

NAME.....

6. (9 points) A ladder 26 feet long leans against a vertical wall. If the lower end of the ladder is moving away from the wall at the rate of 5 feet per second, how fast is the top of the ladder decreasing when the lower end of the ladder is 10 feet from the wall? Make a sketch/identify your variables on the sketch. Give units with your answer.

NAME.....

7. (17 points) Suppose that $f(x) = x^3 - 3x^2 + 9x + 1$. Show your work!

(a). (4 points) Find the crtical numbers of $f(x)$. Then test each critcal number for a relative max/min or neither.

(b). (3 points) Find the open intervals on which $f(x)$ is increasing, and the open intervals on which $f(x)$ is decreasing.

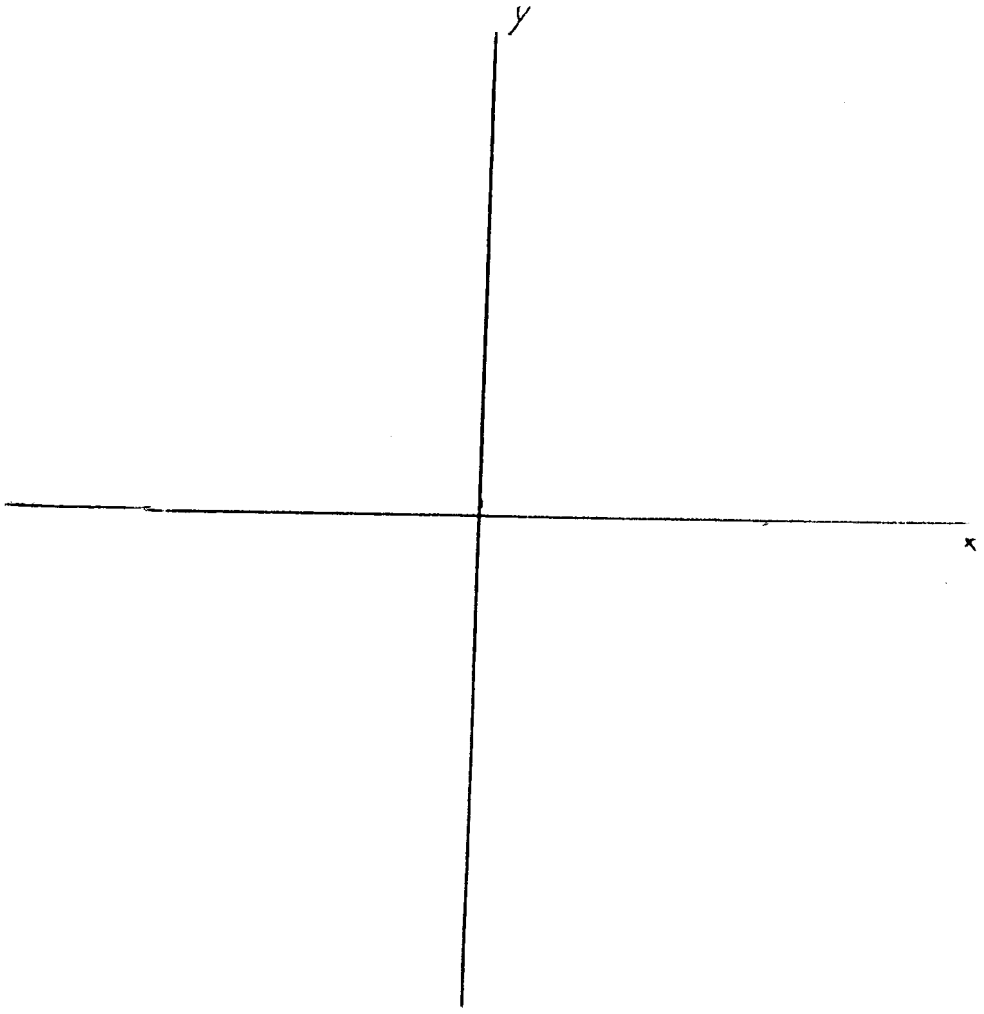
(c). (3 points) Find the open intervals on which the graph of $f(x)$ is concave up, and the open intervals on which the graph of $f(x)$ is concave down.

(This problem is continued on the next page.)

NAME.....

(d). (2 points) Find the inflection point(s) on the graph of $f(x)$.

(e). (5 points) Make a sketch of the graph of $f(x)$ on the coordinate system below. Label and give the coordinates of the points where the tangent line is horizontal, and do the same for the inflection points.



NAME.....

8. (9 points) A rectangular planter of 4200 square feet is to be constructed in front of a garden store. One side of the retaining wall costs \$4.00 per linear foot and the remaining three sides cost \$3.00 per linear foot. Find the dimensions that minimize the cost of the planter's wall. Show your work and justify that your dimensions minimize the cost.

NAME.....

9. (7 points) Suppose that x and y are related by the equation $xy + \ln(y) - 2y^2 = 1$.

(a). (4 points) Using implicit differentiation, find $\dfrac{dy}{dx}$.

(b). (3 points) Find an equation of the tangent line to the graph of $xy + \ln(y) - 2y^2 = 1$ at the point (2,1).

NAME.....

10. (10 points) Suppose that $f(x,y) = \frac{x^2}{2} + \frac{y^3}{3} - xy$.

(a). (6 points) Find all the critical points of $f(x,y)$.

(b). (4 points) Classify (relative max/min or saddle point) the critical points found in part (a).

NAME.....

(This page is for scratch work.)

- The end -
Have a happy and safe summer