MATH 112
Exam II
February 22, 2007

Name ____

Student ID #____________________ Section ____________________

HONOR STATEMENT

"I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam."

SIGNATURE:____

1	18	
2	12	
3	20	
Total	50	

- Your exam should consist of 3 problems. Check that you have a complete exam.
- Turn your cell phone OFF and put it away for the duration of the exam.
- Unless otherwise indicated, you must show your work. The correct answer with no supporting work may result in no credit.
- Unless otherwise indicated, you may round your FINAL ANSWER to two digits after the decimal.
- If you use a guess-and-check method when an algebraic method is available or read a value from a graph on your calculator, you may not receive full credit.
- Put your name on your sheet of notes and turn it in with the exam.

GOOD LUCK!

1. (18 points)

(a) Compute the derivatives. DO NOT SIMPLIFY.

i. $u = \left(v^{2/3} - e^{v^2}\right)^5 - \dfrac{1}{\sqrt{v}}$

$\dfrac{du}{dv} =$

ii. $g(t) = \dfrac{\ln(t^2 + t)}{3e^t - t^2}$

$g'(t) =$

(b) Let $f(x, y) = \dfrac{1}{4}x^2y^4 - 3xy^3 + \dfrac{4y^2}{x}$.

i. Compute $f_x(x, y)$ and $f_y(x, y)$.

ANSWER: $f_x(x, y) =$ ____________________

$f_y(x, y) =$ ____________________

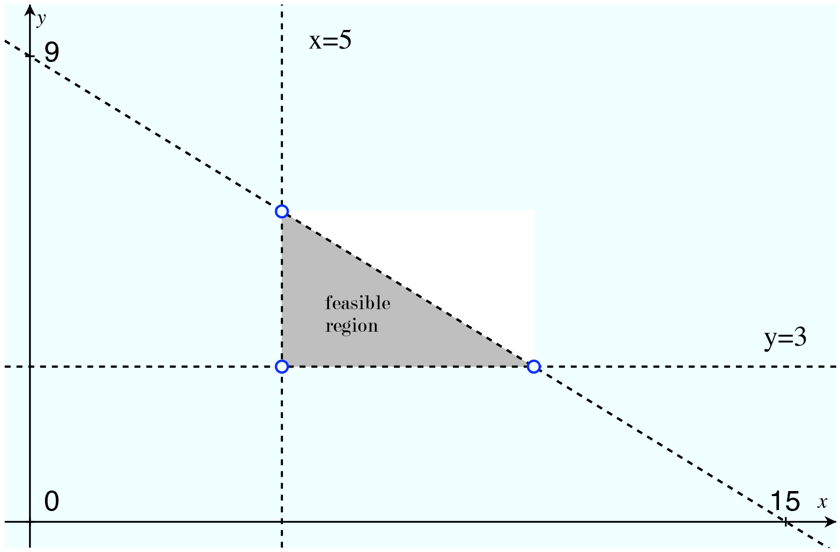
ii. Use partial derivatives to determine which of the following functions is steeper:

A. $h(t) = f(4, t)$ at $t = 3$

B. $k(t) = f(t, -3)$ at $t = 1$

ANSWER: (circle one) A B is steeper

2. (12 points) A linear programming problem has three constraints. Two of those constraints are the inequalities $x \geq 5$ and $y \geq 3$. The feasible region is the SHADED REGION in the graph below.



Find the exact coordinates of the vertices of the feasible region and use them to find the maximum and minimum values of the objective function $T(x, y) = 5.2x + 7.5y$, subject to these constraints.

ANSWER: vertices ________________________

maximum value of $T(x, y)$ is ________________

minimum value of $T(x, y)$ is ________________

3. (20 points) The volume of water in two vats can increase or decrease. The amount in Vat A (in gallons) after t minutes is given by the function

$$A(t) = 5t^2 - 16t + 47.8.$$

The amount in Vat B (in gallons) after t minutes is given by the function

$$B(t) = 10t^3 - 49.5t^2 + 60t + 5.$$

(a) Find all values of t at which the function $B(t)$ has a horizontal tangent line and use the Second Derivative Test to decide whether there is a local maximum or a local minimum at each of those times.

ANSWER: $t =$ ______ gives a local (circle one) maximum minimum

$t =$ ______ gives a local (circle one) maximum minimum

(b) What is the lowest volume of water in Vat B over the period from $t = 0$ to $t = 2$ minutes? (As always, show your work.)

ANSWER: ____________________ gallons

Here are those functions again:

$$A(t) = 5t^2 - 16t + 47.8 \text{ and } B(t) = 10t^3 - 49.5t^2 + 60t + 5.$$

(c) Find the longest interval over which the water level in Vat A and the water level in Vat B are both decreasing, or explain why no such interval exists.

(d) Let $D(t) = A(t) - B(t)$. Find the smallest value of $D(t)$ on the interval from $t = 0$ to $t = 2$. (As always, show all your work.)

ANSWER: ____________________gallons