

Exam 3

Math 220 Sections 01xx

May 4, 2007

Instructions: Put one problem on each answer sheet (use the back if necessary), and put your name, your TA's name, your section number, and the problem number on each page. Only sign the honor pledge on the first sheet. Show all of your work, and justify your answers. Scientific, but **not** graphing calculators are allowed. Unless the problem explicitly requests simplification, no simplification is necessary.

1. Let $f(x, y) = 3e^{xy} + [\ln(xy)]^2$. Compute the following partial derivatives:

(a) (10 points) $\frac{\partial f}{\partial x}$

(b) (10 points) $\frac{\partial^2 f}{\partial x \partial y}$

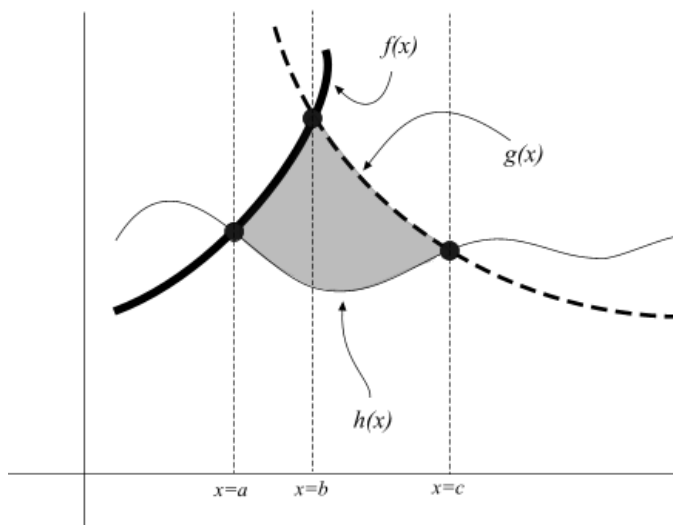
2. Compute the following integrals:

(a) (10 points) $\int \left(\frac{2}{x} + x \right)^2 dx$

(b) (10 points) $\int_0^{\ln(2)} (10e^{2x} + 1) dx$

3. (a) (10 points) Approximate the area under the curve $y = -\frac{1}{x}$ from $x = -4$ to $x = -1$ using a midpoint Riemann sum with $n = 3$ subintervals.

(b) (10 points) Write a formula for the area of the shaded region in the graph to the right. You do not have to evaluate any integrals.



4. (20 points) Let $f(x, y) = x^4 - 4xy + y^4$. The two critical points of $f(x, y)$ are $(0, 0)$ and $(1, 1)$; classify these using the second derivative test. The following formula may help you apply the second derivative test:

$$D(x, y) = \frac{\partial^2 f}{\partial x^2} \cdot \frac{\partial^2 f}{\partial y^2} - \left(\frac{\partial^2 f}{\partial x \partial y} \right)^2.$$

5. (20 points) Find the values of x and y that minimize

$$x^2 + xy + y^2 - 2x - 5y$$

subject to the constraint $x + y = 1$.
