

Name _____ ID _____

MATH 251 Quiz 4 Fall 2005
Sections 503 P. Yasskin

You must do Problem 1.
Then do one (only) of 8, 9, or 10.

1	/ 5
8	/20
9	/20
10	/20
Total	/25

1. (5 points) Find the mass of the solid below $z = x^2y$ above the region in the xy -plane between $y = x$ and $y = x^2$ if the density is $\rho(x,y,z) = 6z$.

8. (20 points) The carbon monoxide density in the air on a certain highway is given by $\rho = \frac{6xy^2}{z}$ where distances are measured in feet and density is measured in parts per million.

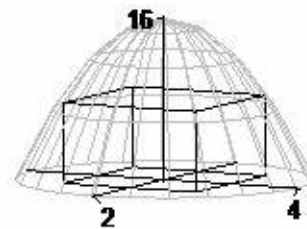
a. If a bird is at the point $(4, 3, 2)$ and its velocity is $(-3, 4, 1)$, does the bird feel the CO density increasing or decreasing and how fast?

b. Use the linear approximation to estimate the CO density at the point $(3.97, 3.04, 2.01)$.

c. If a bird is at the point $(4, 3, 2)$, in what direction should it fly to DECREASE the CO density as fast as possible?

9. (20 points) Find the volume of the largest rectangular box whose base is in the xy -plane, whose sides are parallel to the coordinate planes and whose top 4 vertices are on the elliptic paraboloid

$$z = 16 - 4x^2 - y^2.$$



10. (20 points) Determine whether each of the following limits exists and say why or why not. If the limit exists, find it.

a. $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2y}{x^4 + y^2}$

b. $\lim_{(x,y) \rightarrow (0,0)} \frac{y^2}{x^4 + y^2}$