NAME: _____

Problem	Points
1	/17
2	/17
3	/17
4	/16
5	/17
6	/16
Total	/100

INSTRUCTIONS:

1. Answer the following 6 problems.

2. Write your answers in the space provided. If you do not have enough space, continue on the back side of the *previous* page.

3. Show all details of your work. Answers without justification will receive zero points.

4. Neither notes, books nor calculators are allowed in the exam. You may use a $3'' \times 5''$ notecard.

5. Relax. Think before (and after) doing.

1. Evaluate the multiple integral

$$\iint_D \frac{y}{1+x^2} \, dA,$$

where D is bounded by $y = \sqrt{x}, \ y = 0, \ x = 1.$

2. Evaluate the double integral by reversing the order of integration

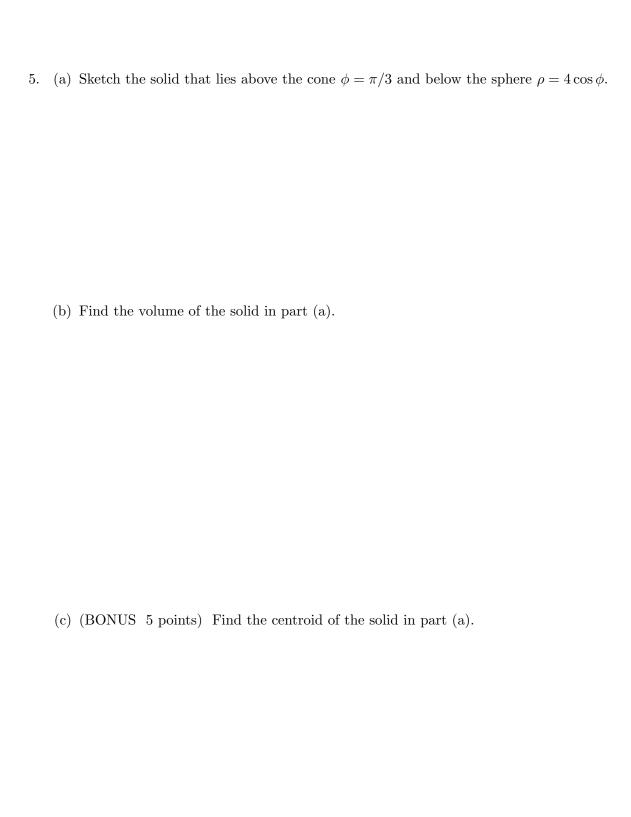$$\int_0^1 \int_x^1 \cos(y^2) \, dy \, dx$$

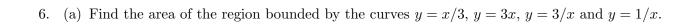3. Evaluate the integral by converting to polar coordinates

$$\int_{-3}^{3} \int_{0}^{\sqrt{9-x^2}} \sin(x^2 + y^2)\, dy\, dx$$

4. (a) Write the integral in the order $dx\, dy\, dz$.

$$\int_{0}^{1} \int_{y}^{1} \int_{0}^{y} f(x, y, z)\, dz\, dx\, dy$$

(b) (BONUS 5 points) Write the integral in the order for which the lower limits of the three integrals are all zero.

5. (a) Sketch the solid that lies above the cone $\phi = \pi/3$ and below the sphere $\rho = 4\cos\phi$.

(b) Find the volume of the solid in part (a).

(c) (BONUS 5 points) Find the centroid of the solid in part (a).

6. (a) Find the area of the region bounded by the curves $y = x/3$, $y = 3x$, $y = 3/x$ and $y = 1/x$.

(b) (BONUS 5 points) Find the centroid of the region in part (a).