Math 125 Autumn 2002 **Quiz #3 Answers**

1. (6 points) Consider the region in the plane bounded by the curves $y = 2x^2$ and $y = x^3$.

   (a)(2 points) Find the area of the region.

   Ans: Find the intersection points of the curves: $2x^2 = x^3$ so $x = 0$ or $x = 2$.
   Area= $\int_0^2 (2x^2 - x^3)dx = \frac{4}{3}$.

   (b)(2 points) Set up an integral which will give the volume of the solid obtained by rotating the region about the x-axis. YOU NEED NOT EVALUATE THE INTEGRAL.

   Ans: (slices) Volume= $\int_0^2 [\pi 4x^4 - \pi x^6]dx$.
   Or (shells) Volume= $\int_0^8 2\pi y(y^{\frac{1}{3}} - (\frac{y}{2})^{\frac{1}{2}})dy$.

   (c)(2 points) Set up an integral which will give the volume of the solid obtained by rotating the region about the vertical line $x = -1$. YOU NEED NOT EVALUATE THE INTEGRAL.

   Ans: (shells) Volume= $\int_0^2 2\pi(x+1)(2x^2 - x^3)dx$.
   Or (slices) Volume= $\int_0^8 [\pi(y^{\frac{1}{3}} + 1)^2 - \pi((\frac{y}{2})^{\frac{1}{2}} + 1)^2]dy$.

2. (4 points) Consider the triangular pyramid with corners (0,0,0), (1,0,0), (0,1,0) and (0,0,1). Set up and evaluate an integral which will give the volume of the triangular pyramid.

   Ans: Volume= $\int_0^1 \frac{1}{2}(1-z)^2 dz = \frac{1}{6}$.