Fall 2000 Math 241 Exam 4

~~100~~ 115

PRINT Your Name:_____

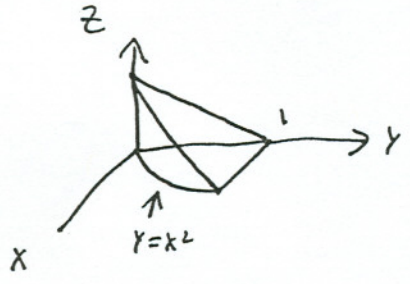
There are 10 problems on 6 pages. Each problem is worth 10 points. SHOW your work. CIRCLE your answer. **NO CALCULATORS!**

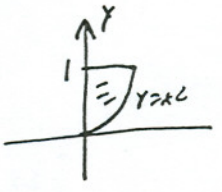
1. Find $\int_0^1 \int_0^{3x} x^2 \, dy \, dx =$ $\int_0^1 x^2 y \Big]_0^{3x} dx = \int_0^1 3x^3 \, dx = \frac{3x^4}{4} \Big]_0^1 = \boxed{\frac{3}{4}}$

16.3/1

2. Find the volume of the solid in the first octant which is bounded by $y = x^2$, $x = 0$, $z = 0$, and $y + z = 1$.

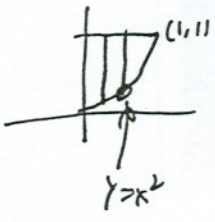
16.3/25



This solid has base 

in the xy Plane and top $z = 1 - y$

$$\text{Vol} = \iint_{\text{base}} 1 - y \, dA = \int_0^1 \int_{x^2}^1 1 - y \, dy \, dx = \int_0^1 y - \frac{y^2}{2} \Big]_{x^2}^1 dx = \int_0^1 1 - \frac{1}{2} - x^2 + \frac{x^4}{2} \, dx$$



$$= \frac{1}{2}x - \frac{x^3}{3} + \frac{x^5}{10} \Big]_0^1 = \frac{1}{2} - \frac{1}{3} + \frac{1}{10}$$

$$= \frac{15 - 10 + 3}{30} = \frac{8}{30} = \boxed{\frac{4}{15}}$$