

Due Thursday, July 10, 2003
at the beginning of class.

Weight: 5 points

1. Without using tables (i.e. show all work), evaluate the following integrals.

(a) $\int x \tan^{-1} x \, dx$

(b) $\int \frac{\sin^3 \theta}{\cos \theta} \, d\theta$

(c) $\int_{-3}^{-1} \frac{dx}{\sqrt{x^2 + 6x + 13}}$

2. Prove (using a trig. substitution, and assuming $a \neq 0$) that

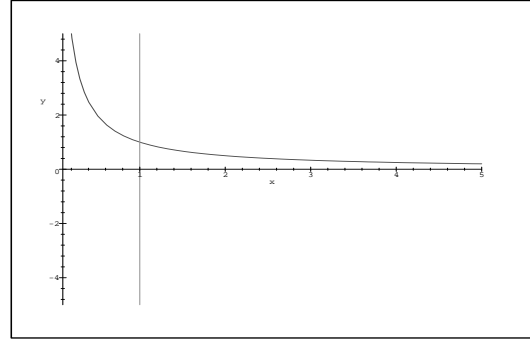
$$\int \frac{dx}{x^2 + a^2} = \frac{1}{a} \tan^{-1} \left(\frac{x}{a} \right) + C$$

(Note: continued...)

3. Calculate the volume of “Gabriel’s Horn”, which is obtained by revolving the curve

$$f(x) = \frac{1}{x} \quad x \geq 1$$

about the x -axis. (See figure).



- (a) Calculate the volume of Gabriel’s Horn *using the method of washers/disks*.
- (b) Calculate the volume of Gabriel’s Horn *using the method of cylindrical shells*.
- (c) Using either the method of washers/disks or the method of cylindrical shells, calculate the volume of the solid obtained by revolving

$$g(x) = \frac{1}{\sqrt{x}} \quad x \geq 1$$

about the x -axis. Compare with your answer above.