

Assignment # 4

Due 6-26-06

- (1) Find the volume of the solid obtained by rotating the region bounded by the given curves about the specified line. Sketch the region, the solid, and a typical disk or “washer”.

(a) $y = x^{\frac{2}{3}}$, $x = 1$, $y = 0$; about the y -axis.

(b) $y = \frac{1}{x}$, $y = 0$, $x = 1$, $x = 3$; about $y = 1$.

- (2) Consider the curve

$$y = 2^x$$

- (a) Set up the integral that represents the length of the curve on the interval $0 \leq x \leq 3$.

- (b) Use a Computer Algebra System to evaluate the integral.

- (3) The following parametric equation describes an astroid:

$$x = 2 \cos^3 \theta,$$

$$y = 2 \sin^3 \theta.$$

- (a) Show a sketch of the astroid.
- (b) Find the equation of the tangent line to the astroid at the point when $\theta = \frac{\pi}{6}$. Show the tangent line on your graph.
- (c) Find the total length of the astroid. To do this, find the length of the part of the curve (by hand) in quadrant I ($0 \leq \theta \leq \frac{\pi}{2}$) and then multiply this answer by 4.

(4) Consider the function $f(x) = \ln x$, on the interval $[1, 3]$.

(a) Find the average value of f on the given interval.

(b) Find c such that $f_{\text{ave}} = f(c)$.

(c) Sketch a graph of f and a rectangle whose area is the same as the area under the graph of f .