

## Honors Calculus 131. Problem set 7.

- 1) Find a number  $a$  such that the line  $x = a$  bisects the area under the curve  $y = 1/x^2$  on  $1 \leq x \leq 4$ .
- 2) Sketch the curve  $y^2 = x^2(x + 3)$ . Find the area enclosed by its loop.
- 3) Find the volume of the solid obtained by rotating the region bounded by  $y = e^{-x}$ ,  $y = 1$ ,  $x = 2$  about the line  $y = 2$ .
- 4) A hole of radius  $r$  is bored through the center of a sphere of radius  $R > r$ . Find the volume of the remaining portion of the sphere.
- 5) Find the volume of the solid obtained by rotating the area enclosed by the curves  $y = x^2$  and  $y = 2 - x^2$  about the line a)  $y = 5$  and b)  $x = -10$ . Use the method of disks and the method of shells in both of them. Discuss the difficulty of each problem.
- 6) Find the length of the curve  $y = \ln(\cos x)$  for  $0 \leq x \leq \pi/3$ .
- 7) Find the arc length of the curve  $y = \sin^{-1} x + \sqrt{1 - x^2}$  starting at the point  $(0, 1)$ . Find an equation for the point that divides this piece of the curve into two segments of the same length.
- 8) Find the surface area of the solid obtained by rotating an ellipse of semi-axis  $a$  and  $b$  about the  $x$ -axis.
- 9) Find the surface area of the solid obtained by rotating the circle  $x^2 + y^2 = r^2$  about the line  $x = 2r$ .