

Math 21B
Kouba
Challenge Sheet 8

- 1.) An object of mass 2 kg. travels with a linear velocity of 5 m./sec. Compute its kinetic energy.
- 2.) A thin, straight rod of mass 2 kg. and length 3 meters rotates around one of its ends at the rate of 5 revolutions per second. SET UP BUT DO NOT EVALUATE integral(s) which represent the kinetic energy of the rod.
- 3.) A thin, flat, square plate of mass 2 kg. and side length 3 meters rotates around one of its edges at the rate of 5 revolutions per second. SET UP BUT DO NOT EVALUATE integral(s) which represent the kinetic energy of the rod.
- 4.) A circular cylinder of mass 2 kg., height 3 meters, and diameter 3 meters rotates around an axis at the rate of 5 revolutions per second. SET UP BUT DO NOT EVALUATE integral(s) which represent the kinetic energy of the rod if the axis is
 - a.) a line through the centers of the circular ends of the cylinder.
 - b.) a line parallel to the axis in part a.) and touching the outer edge of the cylinder.
- 5.) Determine the centroid (\bar{x}, \bar{y}) of the region bounded by the graphs of
 - a.) $y = \ln x$, $x = 2$, and $y = 0$. Does the centroid lie inside the region ?
 - b.) $y = x^4$ and $y = x^5$. Does the centroid lie inside the region ?
- 6.) A tiny volcanic island has formed in the Pacific Ocean. The depth of the ocean x miles from the island is $3x^2$ miles. Compute the volume of ocean water within a 2-mile radius of the island.
- 7.) The region in the first quadrant bounded by the graphs of $y = x^2$, $y = 8 - x^2$, and $x = 0$ is rotated around the y -axis to form a "flying saucer." Sketch a graph of the saucer and compute its volume.

