

Math 21B
Kouba
Discussion Sheet 6

- 1.) Consider a large flat square plate 10 feet by 10 feet submerged in a pool of virgin olive oil (weighing 58 lbs./ft.³) 20 feet deep. Compute the force of olive oil pressure on the plate if the plate
 - a.) lies flat on the bottom of the pool.
 - b.) sits vertically on one edge at the bottom of the pool.
 - c.) sits with one edge on the bottom of the pool and is tilted at 45 degrees from vertical.
 - d.) sits with one edge on the bottom of the pool and is tilted at 30 degrees from vertical.
- 2.) A thin rod lies on the x -axis from $x = 0$ to $x = 20$ centimeters. Assume that the density of the rod x centimeters from its left end is $\delta(x) = \sqrt{x+1}$ grams per centimeter.
 - a.) Determine the following moments.
 - i.) $M_{x=3}$ ii.) $M_{x=15}$
 - b.) Determine the rod's total mass.
 - c.) Determine the rod's center of mass.
- 3.) A thin plate lies in the region bounded by the graphs of $y = x^2$, $x = 2$, and $y = 0$. Assume that the density at point (x, y) of the plate is $\delta(x, y) = 10$ slugs per square inch.
 - a.) Determine the following moments.
 - i.) $M_{x=1}$ ii.) $M_{y=4}$
 - b.) Determine the plate's total mass.
 - c.) Determine the plate's center of mass.
- 4.) A thin plate lies in the region bounded by the graphs of $y = e^x$, $y = 1$, and $x = \ln 3$. Assume that the density at point (x, y) of the plate is $\delta(x, y) = x^2 + 1$ slugs per square inch.
 - a.) Determine the following moments (SET UP ONLY.).
 - i.) $M_{x=0}$ ii.) $M_{y=2}$ (HINT: Use alternate formula and integrate with respect to x .)
 - b.) Determine the plate's total mass (SET UP ONLY.).
 - c.) Determine the plate's center of mass (SET UP ONLY.).
- 5.) Find the centroid of the region bounded by the graphs of $y = x^4$ and $y = x^5$.
- 6.) Find the centroid (Set up but do not evaluate integrals.) of the region bounded by the graphs of $y = x^2$ and $y = x^2(x - 3)$.

THE FOLLOWING PROBLEM IS FOR RECREATIONAL PURPOSES ONLY.

- 7.) You have 8 black socks, 12 blue socks, 10 gray socks, and 5 white socks randomly scattered in your bureau drawer. If you reach into the drawer without looking, how many socks must you take out to be sure of having a matching pair of socks ?