Calculus III Workshop questions: 10/5/16

Problem 1 (15.4, #13)**.** Evaluate $\iint_R \arctan(y/x)\, dA$ using polar coordinates, where $R = \{(x, y) : 1 \leq x^2 + y^2 \leq 4,\ 0 \leq y \leq x\}$.

Problem 2 (15.4, #38)**.** Let D be the disk with center at the origin and radius a. What is the average distance from points in D to the origin?

Problem 3 (15.5, #16)**.** A lamina occupies the region inside the circle $x^2 + y^2 = 2y$ but outside the circle $x^2 + y^2 = 1$. Find the center of mass if the density at any point is inversely proportional to its distance from the origin.

Problem 4 (15.7, #22)**.** Find the volume of the solid enclosed by the cylinder $x^2 + z^2 = 4$ and the planes $y = -1$ and $y + z = 4$.

Problem 5 (15.7, #35)**.** Write five other iterated integrals that are equivalent to the iterated integral

$$\int_0^1 \int_y^1 \int_0^y f(x, y, z)\, dz\, dx\, dy.$$

Problem 6 (15.7, #37)**.** Evaluate the triple integral $\iiint_C (4+5x^2yz^2)\, dV$ using only geometric interpretation and symmetry, where C is the cylindrical region $x^2 + y^2 \leq 4$, $-2 \leq z \leq 2$.

Problem 7 (15.7, #40)**.** Find the center of mass of the solid E of constant density, which is bounded by the parabolic cylinder $z = 1 - y^2$ and the planes $x + z = 1$, $x = 0$, and $z = 0$.