

WORKSHOP 2: DUE TUESDAY, AUGUST 4TH

Work through the following five problems together with the other members of your group, in the class time provided for you. Use books, notes, or any resource you can think of. Then write up formal solutions to the problems assigned at the end of class, and submit your answers next Tuesday.

- (1) First classify the surfaces $\rho^2 = 4\rho \cos \phi$ and $\phi = \pi/3$, and then find the volume of the solid region that lies inside the first and above the second.
- (2) Find the volume of the solid that lies under the paraboloid $z = x^2 + y^2$, above the xy -plane, and inside the cylinder $x^2 + y^2 = 2x$.
- (3) Find the absolute extreme values of the function $f(x, y) = 4xy^2 - x^2y^2 - xy^3$ on the closed triangle D in the xy -plane with vertices $(0, 0)$, $(6, 0)$, and $(0, 6)$, and state all points in D at which these extreme values of f occur.
- (4) Evaluate the integrals

$$\int_0^\pi \int_{x^2}^{\pi^2} \frac{\sin(\sqrt{y})}{y} dy dx \quad \text{and} \quad \int_0^{3/\sqrt{2}} \int_x^{\sqrt{9-x^2}} x \sqrt{x^2 + y^2} dy dx.$$

- (5) Find the volume of the solid bounded by the cylinders $x^2 + y^2 = 1$ and $x^2 + z^2 = 1$.