Third Examination
Thursday, November 2, 2017

Instructions: This exam should be done on your own paper. Your name should be on each sheet and on the back of the last sheet; the answers should appear written carefully and in order. If in doubt, show intermediate steps: Full credit may not be given, even for correct answers, unless work is arranged clearly and explained. This exam is closed book. You may leave after handing in your exam paper, but be sure to check your answers carefully. You may keep this exam sheet. Each problem is worth 25 points.

1. Compute
$$\iint_{\mathcal{R}} x^2 + y^2 \, dA,$$
   where $\mathcal{R}$ is the rectangle defined by $0 \le x \le 1$ and $0 \le y \le 2$.

2. Compute
$$\iint_{\mathcal{D}} x^2 + y^2 \, dA,$$
   where $\mathcal{D}$ is the disk of radius $\left(\dfrac{20}{3\pi}\right)^{1/4}$ centered at the origin $(x, y) = (0, 0)$.

3. Compute the surface area of the portion of the graph of $f(x, y) = \frac{1}{2}(x^2 + y^2)$ over the unit disk $\{(x, y) | x^2 + y^2 \le 1\}$.

4. Compute the improper integral
$$\iiint_{\mathcal{V}} \frac{1}{\sqrt{x^2 + y^2 + z^2}} \, dV,$$
   where $\mathcal{V}$ is the ball (interior of the sphere) $\{(x, y, z) | x^2 + y^2 + z^2 \le 1\}$.