Math 32 – Workshop #22

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1. Evaluate the integral by first sketching the region of integration, and then changing to polar coordinates: $\displaystyle\int_{-2}^{0}\int_{0}^{\sqrt{4-y^2}} \sin(x^2+y^2)\,dxdy$.

2. Using a double integral and polar coordinates to find the volume of the solid bounded by the paraboloids $z = 12 - 2x^2 - y^2$ and $z = x^2 + 2y^2$.

3. Cylindrical Coordinates consist of polar coordinates in the xy-plane, with the added height variable of z, so a point is denoted by (r, θ, z). Sketch a graph of the region describe by the following equations and inequalities in $\mathbb{R}^3$.

   (a) $(r, \theta, z) = \left(2, \dfrac{-\pi}{3}, 5\right)$

   (b) $\theta = \dfrac{\pi}{6}$

   (c) $r = 2$

   (d) $0 \le \theta \le \dfrac{\pi}{4}$

   (e) $0 \le r \le 2,\ 2 \le z \le 5$

   (f) $\dfrac{-3\pi}{2} \le \theta \le \dfrac{-\pi}{2},\ 0 \le r \le 3,\ -7 \le z \le -2$