16 10-23-2025

Remember that when we convert to polar, our Jacobian (coming soon) is r. So

$$\iint_R f(x,y)\ dx\ dy = \iint_R f(r,\theta) r\ dr\ d\theta$$

16.1 Checkpoint 5.17

Sketch the region $R = \{(r,\theta) : r \in [1,2], \theta \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]\}$

16.2 Checkpoint 5.20

Use polar coordinates to find an iterated integral for finding the volume of the solid enclosed by the paraboloids $z = x^2 + y^2$ and $z = 16 - x^2 - y^2$.

16.3 Checkpoint 5.21

Find the area enclosed inside the cardioid $r = 3 - 3\sin\theta$ and outside the cardioid $r = 1 + \sin\theta$

16.4 Checkpoint 5.22

Evaluate the integral

$$\iint_{\mathbb{R}^2} e^{-4\cdot(x^2+y^2)}\ dx\ dy$$