

Name: _____ ID #: _____

NO CALCULATORS

1. [15 points] Set up a double integral to find the volume under the paraboloid $f(x, y) = 1 - x^2 - y^2$, but above the xy -plane. DO NOT EVALUATE THE INTEGRAL.

2. [15 points] Consider $\int_0^1 \int_{x^2}^x f(x, y) dy dx$. Sketch the region of integration in the xy -plane. Then switch the order of integration. DO NOT EVALUATE THE INTEGRAL.

3. [10 points] Find f_{xx} for $f(x, y) = \arctan(y/x)$.

4. [20 points] Graph $r(\theta) = 2 + 2 \sin(4\theta)$ in polar coordinates for $\theta \in [0, 2\pi]$.

5. [20 points] a. Plot the parametric equations

$$\begin{aligned}x(t) &= t + 1 \\ y(t) &= t^2 + 2\end{aligned}$$

for $t \in [0, 3]$.

- b. Set up an integral to find the arc length of the curve in part a.
DO NOT EVALUATE THE INTEGRAL.

6. [20 points] Find the area inside the graph of $r(\theta) = 2 + \cos(\theta)$ for $\theta \in [0, 2\pi]$. (This time you have to do the integral.)