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 $r(\theta) = 2 + 2 \cos(4\theta)$ in polar coordinates for $\theta \in [0, 2\pi]$. 
5. [20 points] a. Plot the parametric equations

\[ x(t) = t + 1 \]
\[ y(t) = t^2 + 2 \]

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.)