

Show all work. 5 points each.

1. Use polar coordinates to find the volume of the solid under the paraboloid $z = x^2 + y^2$ and above the disk $x^2 + y^2 = 9$.

2. The joint density function for a pair of random variables X and Y is

$$f(x, y) = \begin{cases} x(1 + y)/2 & \text{for } 0 \leq x \leq 1 \text{ and } 0 \leq y \leq 2 \\ 0 & \text{else} \end{cases} .$$

Set up the integrals for finding $P(X + Y \leq 1)$ and the expected value of X .