Question

Express the following curves in cylindrical polar coordinates:

(a) $x^2 + y^2 = 1$

(b) $x^2 + y^2 + z^2 = 1$

(c) $(x - \frac{1}{2})^2 + y^2 = 1$

(d) $y = x \tan \phi_0$, where ϕ_0 is a constant.

Answer

(a) $r^2 = 1$

(b) $r^2 + z^2 = 1$

(c) $(r \cos \phi - \frac{1}{2})^2 + r^2 \sin^2 \phi = 1$

$r^2 \cos^2 \phi - 2r \cos \phi + \frac{1}{4} + r^2 \sin^2 \phi = 1$

$r^2 - r \cos \phi - \frac{3}{4} = 0$

(d) $\frac{y}{x} = \tan \theta = \tan \phi_0$ therefore $\theta = \phi_0$