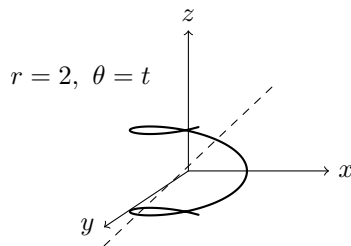


Question 9

A curve is given in cylindrical form by $r = 2$, $\theta = t$, and $z = 3t$. Convert it to rectangular vector form, identify the curve, and find the vertical rise per complete revolution.

Question 9 – Solution

Strategy Substitute into $x = r \cos \theta$, $y = r \sin \theta$ and examine the change when t increases by 2π .



Rectangular form

$$\vec{r}(t) = \langle 2 \cos t, 2 \sin t, 3t \rangle.$$

It is a circular helix of radius 2 around the z -axis.

Pitch One complete revolution corresponds to $\Delta t = 2\pi$. Therefore

$$\Delta z = 3(2\pi) = 6\pi.$$

The constant r keeps the curve on a cylinder, while the linear z -coordinate produces uniform vertical advance.