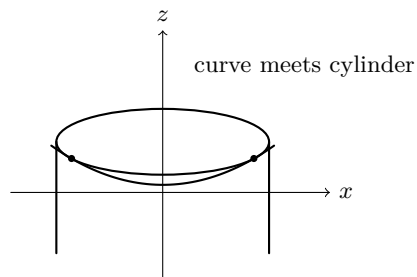


Question 3

The curve $\vec{r}(t) = \langle t, t^2, 2t - 1 \rangle$ meets the cylinder $x^2 + y^2 = 2$. Find every intersection point and the corresponding parameter values.

Question 3 – Solution

Strategy Substitute the curve's coordinate functions into the surface equation.



Parameter equation We need $t^2 + t^4 = 2$. Let $u = t^2 \geq 0$; then $u^2 + u - 2 = 0$, so $(u - 1)(u + 2) = 0$. Thus $t^2 = 1$ and $t = \pm 1$.

Points At $t = 1$, $\vec{r} = (1, 1, 1)$; at $t = -1$, $\vec{r} = (-1, 1, -3)$. Hence the intersections are

$$\boxed{(1, 1, 1) \quad \text{and} \quad (-1, 1, -3)}.$$

Verification Both points satisfy $x^2 + y^2 = 2$.