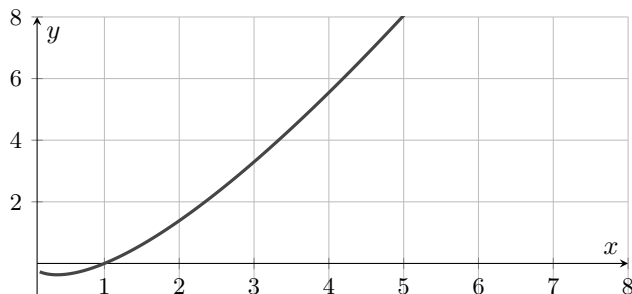


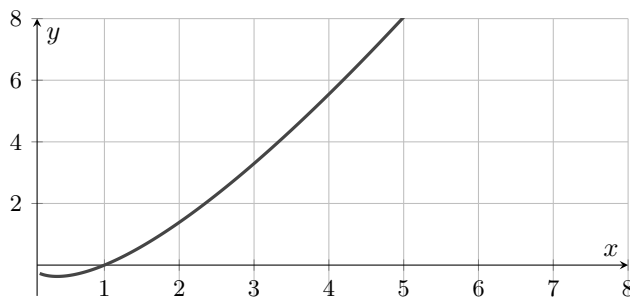
Question 4

Problem

For $x = e^t$, $y = te^t$, find the tangent line at the point whose x -coordinate is 1.



Question 4 – Solution



Solution

1. Locate the required parameter value by solving

$$x = e^t = 1.$$

Since the exponential function equals 1 only at $t = 0$, the required parameter value is $t = 0$.

2. Evaluate the y -coordinate:

$$y(0) = 0 \cdot e^0 = 0.$$

Thus the point of tangency is $(1, 0)$.

3. Differentiate both coordinates. The product rule is needed for y :

$$\frac{dx}{dt} = e^t, \quad \frac{dy}{dt} = e^t + te^t = e^t(1 + t).$$

4. Because $dx/dt = e^t \neq 0$, divide the derivatives:

$$\frac{dy}{dx} = \frac{e^t(1 + t)}{e^t} = 1 + t.$$

At $t = 0$, the slope is $m = 1$.

5. Use point-slope form through $(1, 0)$:

$$y - 0 = 1(x - 1).$$

Therefore, the tangent line is

$$\boxed{y = x - 1}.$$