Parametric gradients and tangent directions

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. Find dy/dx for $x = t^2 + 1, y = 3t$, t nonzero. [2 marks]

Derivatives are 2 t and 3.

Divide y rate by x rate.

Answer: $3/(2t)$

2. Find the tangent at 2 for $x = t, y = t^3$. [2 marks]

The point is (2, 8).

Gradient is $3t^2 = 12$.

Answer: $y - 8 = 12(x - 2)$.

3. Find the tangent at 0 for $(\cos t, \sin t)$. [2 marks]

The point is (1, 0).

The derivative is (0, 1), giving a vertical line.

Answer: $x = 1$.

4. Use a limit to find the tangent at 0 for $x = t^3, y = t^2$. [2 marks]

For nonzero t, $dx/dy = 3t/2$.

This tends to 0, giving a vertical tangent.

Answer: $x = 0$.

5. Give a vector tangent equation at 1 for (t, t^2, t^3). [2 marks]

The point is (1, 1, 1).

The derivative there is (1, 2, 3).

Answer: $\mathbf{x} = (1, 1, 1) + s(1, 2, 3)$.

6. Find the horizontal tangent of $x = 2t, y = t^2 - 4t$. [2 marks]

$dy/dt = 2t - 4 = 0$ gives 2; dx/dt=2.

The corresponding point is (4, -4).

Answer: $y = -4$.