



1. A curve has the equation $y = 2 + \frac{4}{x}$.

a. Find an equation of the normal to the curve at the point $M(4, 3)$.

The normal to the curve at M intersects the curve again at the point N .

b. Find the coordinates of the point N .

(3)

2. A curve has the equation $y = (x + 2)(x - 5)$

a. Find an equation of the normal to the curve at the point $P(2, -12)$.

(3)

Solutions

1a.

$y = 2 + \frac{4}{x}$ $\frac{dy}{dx} = -4x^{-2}$	M1
Gradient at $M = -\frac{1}{4}$ Gradient of normal = 4	M1
$y - 3 = 4(x - 4)$ $y = 4x - 13$	M1

1b.

$4x - 13 = 2 + \frac{4}{x}$ $4x^2 - 15x - 4 = 0$	M1
$(4x + 1)(x - 4) = 0$	M1
$x = 4$ (at M) $x = -\frac{1}{4}$ Therefore, $N(-\frac{1}{4}, -14)$	M1

2.

$y = (x + 2)(x - 5)$ $y = x^2 - 3x - 10$	M1
$\frac{dy}{dx} = 2x - 3$	M1
At $x = 2$, $\frac{dy}{dx} = 2(2) - 3 = 1$ Therefore, gradient of normal = -1	M1
$y - 12 = -1(x - 2)$ $y + 12 = -x + 2$ $y = -x - 10$	M1

