

(2)

$$y = \frac{8}{x^3} = 8x^{-3}$$

$$\frac{dy}{dx} = -24x^{-4} = -\frac{24}{x^4}$$

$$\text{When } x=2, \quad m = -\frac{24}{2^4} = -\frac{24}{16} = -\frac{3}{2}$$

$$\text{When } x=2, \quad y = \frac{8}{2^3} = \frac{8}{8} = 1$$

$$y-1 = -\frac{3}{2}(x-2)$$

$$2(y-1) = -3(x-2)$$

$$2y-2 = -3x+6$$

$$2y = -3x+8 \quad (\text{or equivalent})$$

Question			Generic scheme	Illustrative scheme	Max mark
2.			<ul style="list-style-type: none"> •¹ find y-coordinate •² write in differentiable form •³ differentiate •⁴ find gradient of tangent •⁵ determine equation of tangent 	<ul style="list-style-type: none"> •¹ 1 •² $8x^{-3}$ •³ $8 \times (-3)x^{-4}$ •⁴ $-\frac{3}{2}$ •⁵ $3x + 2y = 8$ 	5

Notes:

1. Only •¹ and •² are available to candidates who integrate. However, see Candidates E and F.
2. $8 \times (-3)x^{-4}$ without previous working gains •² and •³.
3. •³ is only available for differentiating a negative power. •⁴ and •⁵ are still available.
4. •⁴ is not available for $y = -\frac{3}{2}$. However, where $-\frac{3}{2}$ is then used as the gradient of the straight line, •⁴ may be awarded - see Candidates A, B and C.
5. •⁵ is only available where candidates attempt to find the gradient by substituting into their derivative.
6. •⁵ is not available as a consequence of using a perpendicular gradient.
7. Where $x = 2$ has not been used to determine the y -coordinate, •⁵ is not available.

Commonly Observed Responses:

Candidate A - incorrect notation $y = 1$ $y = 8x^{-3}$ $y = -24x^{-4}$ $y = -\frac{3}{2}$ $3x + 2y = 8$			<ul style="list-style-type: none"> •¹ ✓ - BoD •² ✓ •³ ✓ •⁴ ✓ - BoD •⁵ ✓
Candidate B - use of values in equation $y = 1$ $y = 8x^{-3}$ $\frac{dy}{dx} = 8 \times (-3)x^{-4}$ $\frac{dy}{dx} = -\frac{3}{2}$ $y = -\frac{3}{2}$ $3x + 2y = 8$			<ul style="list-style-type: none"> •¹ ✓ - BoD •² ✓ •³ ✓ •⁴ ✓ •⁵ ✓
Candidate C - incorrect notation $y = 1$ $y = 8x^{-3}$ $\frac{dy}{dx} = 8 \times (-3)x^{-4}$ $y = -\frac{3}{2}$			<ul style="list-style-type: none"> •¹ ✓ - BoD •² ✓ •³ ✓ •⁴ ✗
Candidate D $y = 1$ $y = 8x^{-3}$ $\frac{dy}{dx} = 8 \times (-3)x^{-4} = 0$ $8 \times (-3)(2)^{-4} = 0$ $m = -\frac{3}{2}$ $3x + 2y = 8$			<ul style="list-style-type: none"> •¹ ✓ •² ✓ •³ ✓ •⁴ ✗ •⁵ ✓₁

Evidence for •⁴ would need to appear in the equation of the line

Question	Generic scheme	Illustrative scheme	Max mark
2. (continued)			
Candidate E - integrating in part $y = 1$ $y = 8x^{-3}$ $\frac{dy}{dx} = -24x^{-2}$ $\frac{dy}{dx} = -6$ $y = -6x + 13$	$\bullet^1 \checkmark$ $\bullet^2 \checkmark$ $\bullet^3 \times$ $\bullet^4 \checkmark_1$ $\bullet^5 \checkmark_1$	Candidate F - appearance of $+c$ $y = 1$ $y = 8x^{-3}$ $\frac{dy}{dx} = -24x^{-4} + c$	$\bullet^1 \checkmark$ $\bullet^2 \checkmark$ $\bullet^3 \times \bullet^4 \times$ $\bullet^5 \times$