Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

- $\dfrac{1}{1+x^4} \times 2x$
- $\boldsymbol{\dfrac{2x}{1+x^4}}$

2.2

- product rule
- $\mathbf{e^{-x}(2\cos 2x - \sin 2x)}$

2.3

- $\dfrac{f'}{f}$
- $\boldsymbol{\dfrac{6x}{3x^2+1}}$

2.4

- $5^x = e^{x \ln 5}$
- $\mathbf{5^x \ln 5}$

3.1

(a) $\dfrac{dx}{dt} = -2\sin t$, $\dfrac{dy}{dt} = 3\cos t$; ratio simplified

(b)

- point $\left(2,\ \frac{3\sqrt{3}}{2}\right)$, gradient $-\frac{\sqrt{3}}{2}$
- $\boldsymbol{\sqrt{3}x + 2y = 5\sqrt{3}}$

3.2

- product rule
- $\dfrac{dy}{dx} = e^{-x^2}(1-2x^2)$
- $e^{-x^2} \neq 0$, so $1 - 2x^2 = 0$
- $\mathbf{x = \pm\frac{1}{\sqrt{2}}}$

3.3

(a)

- $2xy + x^2\dfrac{dy}{dx}$
- $+\,3y^2\dfrac{dy}{dx} = 0$
- rearranged

(b) gradient $-\dfrac{6}{12} = -\frac{1}{2}$; normal gradient 2; $\mathbf{y = 2x - 5}$