1 **a** $2x$ **b** $4x^3$ **c** 1 **d** $9x^8$ **e** $-3x^{-4}$ **f** $-x^{-2}$
g $8x$ **h** 7 **i** $10x^4$ **j** 0 **k** $-16x^{-3}$ **l** $-44x^{-5}$

2 **a** $5x^4 + 2x$ **b** $1 + 3x^2$ **c** $4x^3$ **d** $6x^5 - 2$
e $18x^2 - 10x^{-3}$ **f** $2x - 4$ **g** $-x^{-2} + 5x^{-6}$ **h** $12x^2 - 12x^{-5}$

3 **a** $6t^5$ **b** $-15t^{-4}$ **c** $\frac{1}{2}t^{-\frac{1}{2}}$ **d** $\frac{2}{3}t^{-\frac{1}{3}}$ **e** $\frac{3}{2}t$ **f** $2t^{-\frac{3}{4}}$
g $7t^{\frac{5}{2}}$ **h** $-\frac{1}{5}t^{-\frac{6}{5}}$ **i** $\frac{3}{5}t^{\frac{1}{5}}$ **j** $-\frac{3}{2}t^{-\frac{5}{2}}$ **k** $-15t^{-\frac{9}{4}}$ **l** $\frac{2}{9}t^{\frac{1}{3}}$

4 **a** $2 + 2x^5$ **b** $\frac{3}{2}x^{\frac{1}{2}}$ **c** $1 + 2x^{-\frac{1}{2}}$ **d** $10x^{\frac{2}{3}} + 4x^{-5}$
e $-\frac{4}{5}x^{-\frac{9}{5}}$ **f** $\frac{1}{3}x^{-\frac{5}{6}} + \frac{3}{4}x^{-\frac{1}{4}}$ **g** $-3x^{-2} + \frac{15}{2}x^{-\frac{5}{2}}$ **h** $7x^{-2} - \frac{8}{3}x^{-\frac{11}{3}}$

5 **a** $y = x^{\frac{1}{2}}$, $\frac{dy}{dx} = \frac{1}{2}x^{-\frac{1}{2}}$ **b** $y = 4 - x^{-1}$, $\frac{dy}{dx} = x^{-2}$ **c** $y = 3x^2 + x^{\frac{1}{3}}$, $\frac{dy}{dx} = 6x + \frac{1}{3}x^{-\frac{2}{3}}$ **d** $y = 9x + 3x^{-1}$, $\frac{dy}{dx} = 9 - 3x^{-2}$
e $y = \frac{1}{4}x^{-1} - x^{-2}$, $\frac{dy}{dx} = -\frac{1}{4}x^{-2} + 2x^{-3}$ **f** $y = 6x^{-\frac{1}{4}}$, $\frac{dy}{dx} = -\frac{3}{2}x^{-\frac{5}{4}}$ **g** $y = x^{\frac{5}{2}}$, $\frac{dy}{dx} = \frac{5}{2}x^{\frac{3}{2}}$ **h** $y = 8x^{\frac{1}{2}} + \frac{4}{3}x^{-2}$, $\frac{dy}{dx} = 4x^{-\frac{1}{2}} - \frac{8}{3}x^{-3}$

6 **a** $s = t^2 + 3t$, $\frac{ds}{dt} = 2t + 3$ **b** $s = t^2 - 4t + 4$, $\frac{ds}{dt} = 2t - 4$ **c** $s = 5t^4 + 20t^2$, $\frac{ds}{dt} = 20t^3 + 40t$ **d** $s = 7t^3 - t$, $\frac{ds}{dt} = 21t^2 - 1$
e $s = t^2 + 7t + 6$, $\frac{ds}{dt} = 2t + 7$ **f** $s = t^2 - 2t - 8$, $\frac{ds}{dt} = 2t - 2$ **g** $s = t^5 + 3t^3 + 9t$, $\frac{ds}{dt} = 5t^4 + 9t^2 + 9$ **h** $s = 2t^3 - 5t^2 + 3t$, $\frac{ds}{dt} = 6t^2 - 10t + 3$

7 **a** $y = x^{\frac{3}{2}} - 4x^{\frac{1}{2}}$, $\frac{dy}{dx} = \frac{3}{2}x^{\frac{1}{2}} - 2x^{-\frac{1}{2}}$ **b** $y = x^2 - 2$, $\frac{dy}{dx} = 2x$ **c** $y = 4x + x^{-1}$, $\frac{dy}{dx} = 4 - x^{-2}$ **d** $y = x^{\frac{1}{2}} + 3x^{-\frac{1}{2}}$, $\frac{dy}{dx} = \frac{1}{2}x^{-\frac{1}{2}} - \frac{3}{2}x^{-\frac{3}{2}}$
e $y = 2x^{-1} - \frac{1}{2}x^2$, $\frac{dy}{dx} = -2x^{-2} - x$ **f** $y = 5x^{-2} + x^{-\frac{3}{2}}$, $\frac{dy}{dx} = -10x^{-3} - \frac{3}{2}x^{-\frac{5}{2}}$ **g** $y = 3 - \frac{2}{3}x^{-1}$, $\frac{dy}{dx} = \frac{2}{3}x^{-2}$ **h** $y = 2x^{\frac{1}{2}} + \frac{1}{4}x^{\frac{5}{2}}$, $\frac{dy}{dx} = x^{-\frac{1}{2}} + \frac{5}{8}x^{\frac{3}{2}}$

8 **a** $\frac{dy}{dx} = 8x - 1$, $\frac{d^2y}{dx^2} = 8$ **b** $\frac{dy}{dx} = 3x^2 + 10x + 2$, $\frac{d^2y}{dx^2} = 6x + 10$ **c** $\frac{dy}{dx} = 2x^{-2}$, $\frac{d^2y}{dx^2} = -4x^{-3}$
d $\frac{dy}{dx} = 8x^3 + 6x$, $\frac{d^2y}{dx^2} = 24x^2 + 6$ **e** $y = 3x^4 - 4x^{-2}$, $\frac{dy}{dx} = 12x^3 + 8x^{-3}$, $\frac{d^2y}{dx^2} = 36x^2 - 24x^{-4}$ **f** $\frac{dy}{dx} = 3x^{-\frac{1}{2}} + \frac{1}{2}x^{-\frac{3}{2}}$, $\frac{d^2y}{dx^2} = -\frac{3}{2}x^{-\frac{3}{2}} - \frac{3}{4}x^{-\frac{5}{2}}$