1 Differentiate with respect to x

a $(x+3)^5$ **b** $(2x-1)^3$ **c** $(8-x)^7$ **d** $2(3x+4)^6$

e $(6-5x)^4$ **f** $\frac{1}{x-2}$ **g** $\frac{4}{(2x+3)^3}$ **h** $\frac{1}{(7-3x)^2}$

2 Differentiate with respect to t

a $2e^{3t}$ **b** $\sqrt{4t-1}$ **c** $5\ln 2t$ **d** $(8-3t)^{\frac{3}{2}}$

e $3\ln(6t+1)$ **f** $\frac{1}{2}e^{5t+4}$ **g** $\frac{6}{\sqrt[3]{2t-5}}$ **h** $2\ln(3-\frac{1}{4}t)$

3 Find $\frac{d^2y}{dx^2}$ for each of the following.

a $y=(3x-1)^4$ **b** $y=4\ln(1+2x)$ **c** $y=\sqrt{5-2x}$

4 Find the value of $f'(x)$ at the value of x indicated in each case.

a $f(x)=x^2-6\ln 2x$, $x=3$ **b** $f(x)=3+2x-e^{x-2}$, $x=2$

c $f(x)=(2-5x)^4$, $x=\frac{1}{2}$ **d** $f(x)=\frac{4}{x+5}$, $x=-1$

5 Find the value of x for which $f'(x)$ takes the value indicated in each case.

a $f(x)=4\sqrt{3x+15}$, $f'(x)=2$ **b** $f(x)=x^2-\ln(x-2)$, $f'(x)=5$

6 Differentiate with respect to x

a $(x^2-4)^3$ **b** $2(3x^2+1)^6$ **c** $\ln(3+2x^2)$ **d** $(2+x)^3(2-x)^3$

e $\left(\frac{x^4+6}{2}\right)^8$ **f** $\frac{1}{\sqrt{3-x^2}}$ **g** $4+7e^{x^2}$ **h** $(1-5x+x^3)^4$

i $3\ln(4-\sqrt{x})$ **j** $(e^{4x}+2)^7$ **k** $\frac{1}{5+4\sqrt{x}}$ **l** $(\frac{2}{x}-x)^5$

7 Find the coordinates of any stationary points on each curve.

a $y=(2x-3)^5$ **b** $y=(x^2-4)^3$ **c** $y=8x-e^{2x}$

d $y=\sqrt{1+2x^2}$ **e** $y=2\ln(x-x^2)$ **f** $y=4x+\frac{1}{x-3}$

8 Find an equation for the tangent to each curve at the point on the curve with the given x-coordinate.

a $y=(3x-7)^4$, $x=2$ **b** $y=2+\ln(1+4x)$, $x=0$

c $y=\frac{9}{x^2+2}$, $x=1$ **d** $y=\sqrt{5x-1}$, $x=\frac{1}{4}$

9 Find an equation for the normal to each curve at the point on the curve with the given x-coordinate.

a $y=e^{4-x^2}-10$, $x=-2$ **b** $y=(1-2x^2)^3$, $x=\frac{1}{2}$

c $y=\frac{1}{2-\ln x}$, $x=1$ **d** $y=6e^{\frac{x}{3}}$, $x=3$