

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 $y = 6e^{\frac{x}{3}},$

$x = 3$