

EXERCISE 15B.2

1 Write in the form au^n , clearly stating what u is:

a $\frac{1}{(2x-1)^2}$

b $\sqrt{x^2-3x}$

c $\frac{2}{\sqrt{2-x^2}}$

d $\sqrt[3]{x^3-x^2}$

e $\frac{4}{(3-x)^3}$

f $\frac{10}{x^2-3}$

2 Find the gradient function $\frac{dy}{dx}$ for:

a $y = (4x-5)^2$

b $y = \frac{1}{5-2x}$

c $y = \sqrt{3x-x^2}$

d $y = (1-3x)^4$

e $y = 6(5-x)^3$

f $y = \sqrt[3]{2x^3-x^2}$

g $y = \frac{6}{(5x-4)^2}$

h $y = \frac{4}{3x-x^2}$

i $y = 2\left(x^2 - \frac{2}{x}\right)^3$

3 Find the gradient of the tangent to:

a $y = \sqrt{1-x^2}$ at $x = \frac{1}{2}$

b $y = (3x+2)^6$ at $x = -1$

c $y = \frac{1}{(2x-1)^4}$ at $x = 1$

d $y = 6 \times \sqrt[3]{1-2x}$ at $x = 0$

e $y = \frac{4}{x+2\sqrt{x}}$ at $x = 4$

f $y = \left(x + \frac{1}{x}\right)^3$ at $x = 1$

4 The gradient function of $f(x) = (2x - b)^a$ is $f'(x) = 24x^2 - 24x + 6$.
Find the constants a and b .

5 Suppose $y = \frac{a}{\sqrt{1+bx}}$ where a and b are constants.

Find a and b given that when $x = 3$, $y = 1$ and $\frac{dy}{dx} = -\frac{1}{8}$.

6 If $y = x^3$ then $x = y^{\frac{1}{3}}$.

a Find $\frac{dy}{dx}$ and $\frac{dx}{dy}$ and hence show that $\frac{dy}{dx} \times \frac{dx}{dy} = 1$.

b Explain why $\frac{dy}{dx} \times \frac{dx}{dy} = 1$ whenever these derivatives exist for any general function $y = f(x)$.