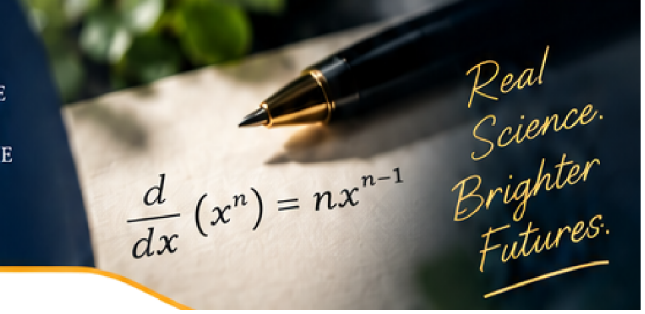

Mathematics 6.5 – The Quotient Rule

WORKSHEET

Practise Apply Improve Succeed

1 Simple quotients (polynomials)

Differentiate the following.

a) $y = \dfrac{x}{x+1}$

b) $y = \dfrac{2x+3}{x}$

c) $y = \dfrac{x^2+1}{x-2}$

d) $y = \dfrac{3x-1}{2x+5}$

e) $y = \dfrac{x^2-4}{x+1}$

f) $y = \dfrac{5-x}{x^2+3}$

2 Quotients with trigonometric functions

Differentiate the following.

a) $y = \dfrac{\sin x}{x}$

b) $y = \dfrac{\cos x}{x+1}$

c) $y = \dfrac{\sin x + 1}{x}$

d) $y = \dfrac{x}{\cos x}$

e) $y = \dfrac{2x+1}{\sin x}$

f) $y = \dfrac{\cos x}{x-1}$

3 More polynomial quotients

Differentiate the following.

a) $y = \dfrac{x^2+1}{3x-2}$

b) $y = \dfrac{2x+1}{x^2+4}$

c) $y = \dfrac{x^3-1}{x+2}$

d) $y = \dfrac{4-x^2}{2x-1}$

e) $y = \dfrac{x^2+3x}{x^2+1}$

f) $y = \dfrac{3x+5}{x^2-4}$

4 Quotients with composite functions (use the chain rule)

Differentiate the following.

a) $y = \dfrac{x^2+1}{\sin x}$

b) $y = \dfrac{\sin(2x)}{x^2+1}$

c) $y = \dfrac{\cos(x^2)}{x}$

d) $y = \dfrac{2x+1}{\sin(3x)}$

e) $y = \dfrac{1+\cos(x^2)}{x-2}$

f) $y = \dfrac{\sin(x^2)}{x^2+1}$

5 Mixed functions

Differentiate the following. (Use the product rule where needed.)

a) $y = \dfrac{x^2+1}{x-1}$

b) $y = \dfrac{\sin(2x)}{x+1}$

c) $y = \dfrac{2x-1}{\sin(3x)}$

d) $y = \dfrac{x^2+3x+1}{x^2+1}$

e) $y = \dfrac{\cos(2x)}{x-3}$

f) $y = \dfrac{3x^2-2x}{\sin x}$

6 Problem solving and applications

a) Given $y = \dfrac{x^2+1}{x-1}$, find $\dfrac{dy}{dx}$ and simplify your answer.

b) The function $y = \dfrac{\sin x}{x+2}$. Find the gradient of the curve at the point $x = 0$.

c) The function $y = \dfrac{2x+1}{\cos x}$. Find the gradient of the curve at the point $x = \dfrac{\pi}{4}$.

d) Given $y = \dfrac{x^2-4}{x+1}$, find the values of x for which y is not defined, and state any restrictions on x.

7 Challenge

Differentiate the following.

a) $y = \dfrac{x^2+\sin x}{x-2}$

b) $y = \dfrac{\sin(3x)+x}{x^2+1}$

c) $y = \dfrac{x\cos x}{x^2-1}$

d) $y = \dfrac{x^2+1}{\sin(2x)}$

e) $y = \dfrac{2x+\cos x}{x^2-3x+1}$

f) $y = \dfrac{1+\sin(x^2)}{x+1}$

8 Key skills checked

- ☐ use the quotient rule with u (numerator) and v (denominator)
- ☐ differentiate polynomials
- ☐ differentiate trigonometric functions
- ☐ use the chain rule where needed (from 6.3)
- ☐ use the product rule where needed (from 6.4)
- ☐ simplify your answers
- ☐ identify any restrictions on the domain (values where $v = 0$)
- ☐ apply differentiation to solve problems
- ☐ check your answers for sensible form and sign

"Practice today, greater possibilities tomorrow."