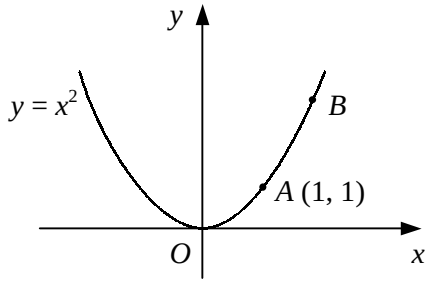
DIFFERENTIATION

You will need to use a calculator for this worksheet

1



The diagram shows the curve $y = x^2$ which passes through the point A (1, 1) and the point B.

a Copy and complete the table to find the gradient of the chord AB when the x-coordinate of B takes each of the given values.

x-coordinate of B	y-coordinate of B	gradient of AB
2	4	$\frac{4-1}{2-1} = 3$
1.1	1.21	
1.01		
1.001		

b Suggest a value for the gradient of the tangent to the curve $y = x^2$ at the point (1, 1).

c Repeat part **a** using 0, 0.9, 0.99 and 0.999 as the x-coordinates of B and comment on your answer to part **b**.

2 Use a similar table of values to that in question **1** to find a value for the gradient of the tangent to the curve $y = x^2$ at the point A when A has the coordinates

a (2, 4) **b** (4, 16) **c** (1.5, 2.25) **d** (–3, 9)

3 **a** Using your answers to questions **1** and **2**, suggest an expression in terms of x for the gradient of the curve $y = x^2$ at the point (x, y).

b Write down the gradient of the curve $y = x^2$ at the points

i (6, 36) **ii** (2.4, 5.76) **iii** (–3.2, 10.24)

4 By considering the gradient of a suitable sequence of chords, find a value for the gradient of each curve at the given point.

a $y = x^4$ at (1, 1) **b** $y = x^2 - 5x + 3$ at (2, –3)

c $y = \sqrt{x}$ at (4, 2) **d** $y = \frac{2}{x}$ at (2, 1)

5 **a** By considering the gradient of a suitable sequence of chords, find a value for the gradient of the curve $y = x^3$ at the points

i (1, 1) **ii** (2, 8) **iii** (3, 27)

b Suggest an expression of the form kx^n for the gradient of the curve $y = x^3$ at the point (x, y).

c Find the gradient of the curve $y = x^3$ at the points

i (4, 64) **ii** (–2, –8) **iii** (1.5, 3.375)