

# IGCSE Mathematics Revision

## Session 5

<p><b>3.2 Function notation</b></p>	<p>understand the concept that a function is a mapping between elements of two sets</p> <p>use function notations of the form <math>f(x) = \dots</math> and <math>f: x \mapsto \dots</math></p> <p>understand the terms domain and range and which parts of a domain may need to be excluded</p> <p>understand and use the notations composite function <math>fg</math> and inverse function <math>f^{-1}</math></p>	<p>i.e. <math>f(x) = 1/x, x \neq 0</math></p> <p>'fg' will mean 'do g first, then f'</p>
<p><b>3.4 Calculus</b></p>	<p>find the gradients of non-linear graphs</p> <p>understand the concept of a variable rate of change</p> <p>differentiate integer powers of <math>x</math></p> <p>determine gradients, rates of change, turning points (maxima and minima) by differentiation and relate these to graphs</p> <p>distinguish between maxima and minima by considering the general shape of the graph</p> <p>apply calculus to linear kinematics and to other simple practical problems</p>	<p>By drawing a tangent</p> <p><math>y = x + \frac{9}{x}</math>.</p> <p>Find the coordinates of the maximum and minimum points</p> <p>The displacement, <math>s</math> metres, of a particle from a fixed point <math>O</math> after <math>t</math> seconds is given by <math>s = 24t^2 - t^3, 0 \leq t \leq 20</math>. Find expressions for the velocity and the acceleration.</p>

f and g are functions.

$$f : x \mapsto 2x - 3$$

$$g : x \mapsto 1 + \sqrt{x}$$

(a) Calculate  $f(-4)$

.....  
(2)

(b) Given that  $f(a) = 5$ , find the value of  $a$ .

$a =$  .....  
(2)

(c) Calculate  $gf(6)$

.....  
(2)

(d) Which values of  $x$  cannot be included in the domain of  $g$ ?

.....  
(1)

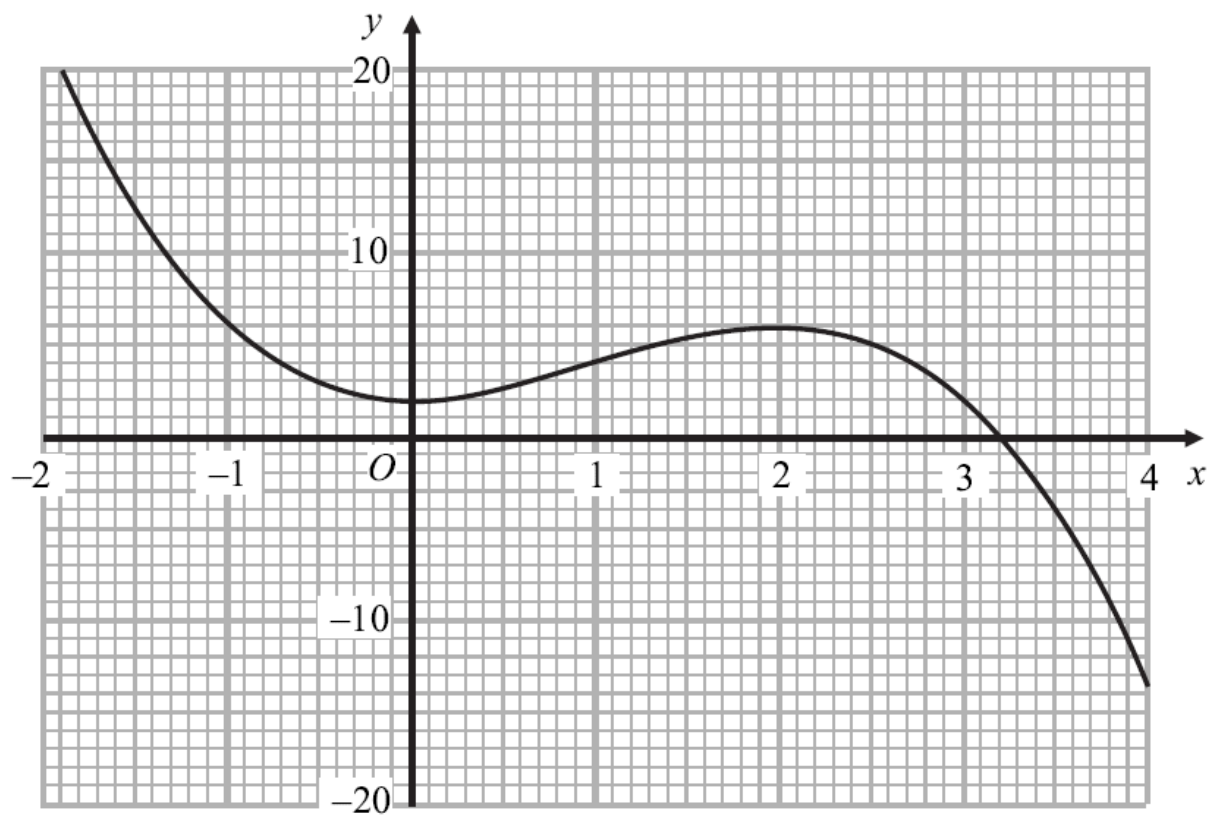
(e) Find the inverse function  $g^{-1}$  in the form  $g^{-1} : x \mapsto \dots$

.....  
(3)

**(Total 10 marks)**

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The diagram shows part of the graph of  $y = f(x)$ .



Find an estimate for the gradient of the curve at the point where  $x = -1$

(d) For  $y = x^2 - 2x - 4$

(i) find  $\frac{dy}{dx}$ ,

.....

(ii) find the gradient of the curve at the point where  $x = 6$

.....

**(4)**

A curve has equation  $y = x^2 + \frac{16}{x}$

The curve has one turning point.

Find  $\frac{dy}{dx}$  and use your answer to find the coordinates of this turning point.

A particle moves along a line.

For  $t \geq 1$ , the distance of the particle from  $O$  at time  $t$  seconds is  $x$  metres, where

$$x = \frac{20}{t}$$

Find an expression for the acceleration of the particle.

$$-11, 4, 4, x < 0, g^{-1} : x \mapsto (x-1)^2$$

About -10

— . 10

$$\frac{dy}{dx} = 2x - 16x^{-2} \Rightarrow 2x - \frac{16}{x^2} = 0 \Rightarrow x = 2. \text{ Coords } (2, 12)$$

$$\frac{dx}{dt} = -20t^{-2} \Rightarrow a = 40t^{-3}$$