

# Pearson Edexcel A Level Mathematics 9MA0

## Unit Test 3 Functions Modelling

Time allowed: 50 minutes

School: [www.CasperYC.club](http://www.CasperYC.club)

Name:

Teacher:

How I can achieve better:

- 
- 
- 

Question	Points	Score
1	10	
2	6	
3	7	
4	6	
5	9	
6	8	
7	4	
Total:	50	

Last updated: January 11, 2026



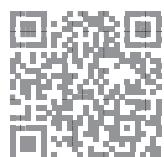
$$1. \ f(x) = |2x + 3| - 4, x \in \mathbb{R}$$

(a) Sketch the graph of  $y = f(x)$ , labelling its vertex and any points of intersection with the coordinate axes. [5]

(b) Find the coordinates of the points of intersection of [5]

$$y = |2x + 3| - 4 \quad \text{and} \quad y = -\frac{1}{4}x + 2$$

Total: 10



2. The functions  $p$  and  $q$  are defined by

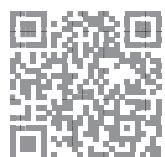
$$p: x \rightarrow x^2 \quad \text{and} \quad q: x \rightarrow 5 - 2x$$

(a) Given that  $pq(x) = qp(x)$ , show that

$$3x^2 - 10x + 10 = 0.$$

(b) Explain why  $3x^2 - 10x + 10 = 0$  has no real solutions.

Total: 6



3. The functions  $f$  and  $g$  are defined by

$$f(x) = e^{2x} + 4, x \in \mathbb{R} \quad \text{and} \quad g(x) = \ln(x+1), x \in \mathbb{R}, x > -1$$

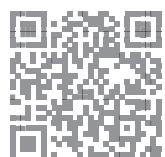
(a) Find  $fg(x)$  and state its range.

[4]

(b) Solve  $fg(x) = 85$ .

[3]

Total: 7

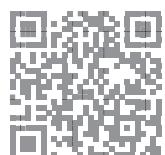


4. The function  $g(x)$  is defined by

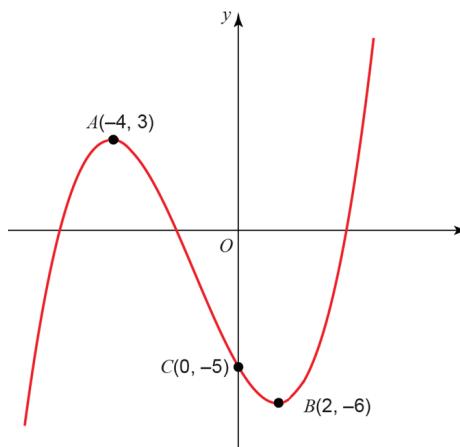
[6]

$$g(x) = x^2 - 8x + 7, x \in \mathbb{R}, x > 4.$$

Find  $g^{-1}(x)$  and state its domain and range.



5. The diagram shows the graph of  $h(x)$ .



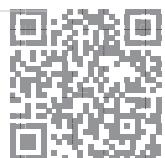
The points  $A(-4, 3)$  and  $B(2, -6)$  are turning points on the graph and  $C(0, -5)$  is the  $y$ -intercept.

Sketch on separate diagrams, the graphs of

(a)  $y = |f(x)|$ . [3]  
(b)  $y = f(|x|)$ . [3]  
(c)  $y = 2f(x + 3)$ . [3]

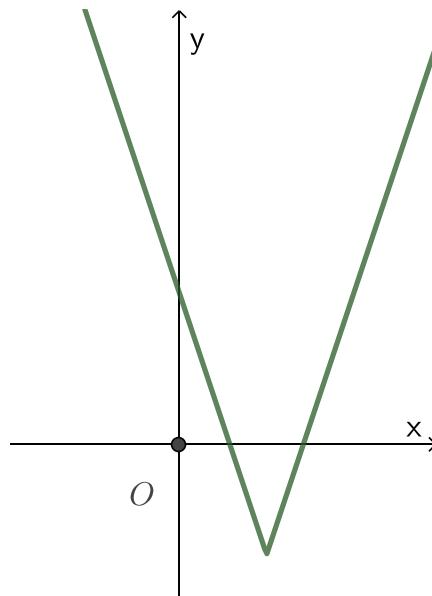
Where possible, label clearly the transformations of the points  $A$ ,  $B$  and  $C$  on your new diagrams and give their coordinates.

Total: 9



6. The diagram shows a sketch of part of the graph  $y = f(x)$  where

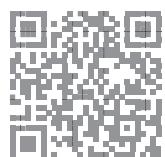
$$f(x) = 3|x - 4| - 5.$$



(a) State the range of  $f$ . [1]

(b) Given that  $f(x) = -\frac{1}{3}x + k$ , where  $k$  is a constant has two distinct roots, state the possible values of  $k$ . [7]

Total: 8



7. The temperature of a mug of coffee at time  $t$  can be modelled by the equation

$$T(t) = T_R + (90 - T_R) e^{-\frac{1}{20}t}$$

where  $T(t)$  is the temperature, in  $^{\circ}\text{C}$ , of the coffee at time  $t$  minutes after the coffee was poured into the mug and  $T_R$  is the room temperature in  $^{\circ}\text{C}$ .

(a) Using the equation for this model, explain why the initial temperature of the coffee is independent of the initial room temperature. [2]

(b) Calculate the temperature of the coffee after 10 minutes if the room temperature is 20°C. [2]

Total: 4

