

Gradients and Areas Under Graphs

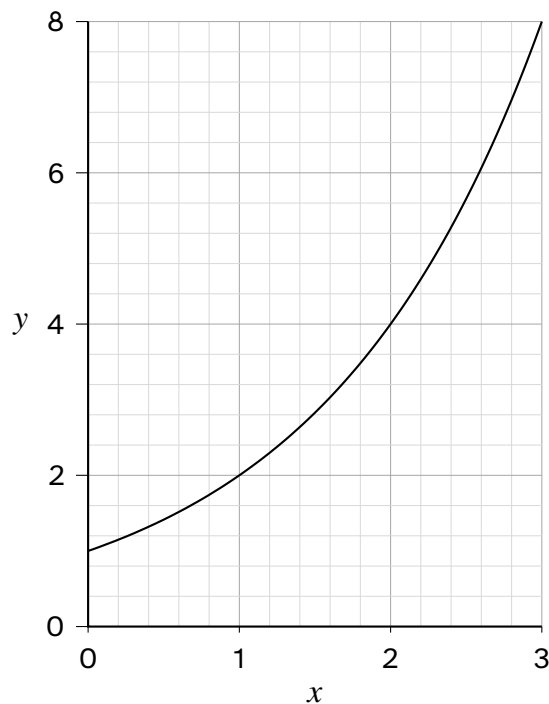
For Pearson Edexcel GCSE Mathematics (1MA1) • Higher tier

Name _____

Total marks: **26**

Answer **all** questions in the spaces provided. Show your working: marks are given for correct method. You may use a calculator.

1 Here is the graph of $y = 2^x$ for $0 \leq x \leq 3$



(a) Estimate the gradient of the curve at the point where $x = 2$

.....
(3)

- (b) Use 3 strips of equal width to estimate the area under the curve between $x = 0$ and $x = 3$

.....
(3)

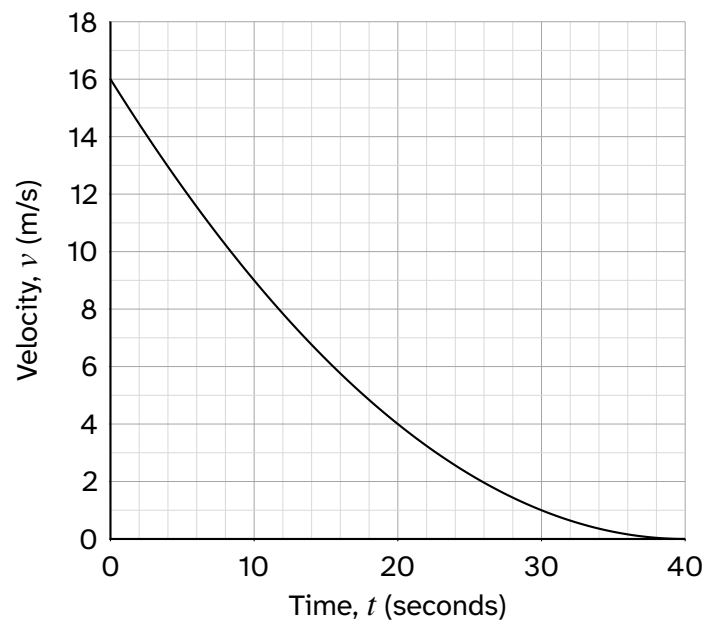
- (c) Is your answer to part (b) an underestimate or an overestimate of the area?
Give a reason for your answer.

.....
.....
(1)

(Total for Question 1 is 7 marks)

.....

- 2 The engine of a speedboat is switched off.
The graph shows the velocity, v m/s, of the speedboat t seconds after the engine is switched off.



- (a) Work out an estimate for the gradient of the graph at $t = 20$
You must show how you get your answer.

.....
(3)

- (b) Describe fully what your answer to part (a) represents.

.....
.....
(1)

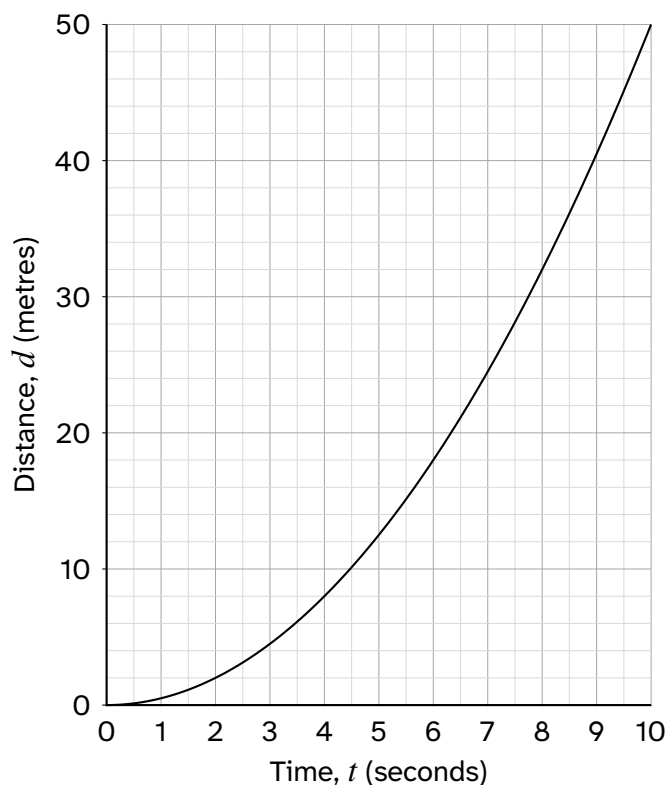
- (c) Work out an estimate for the total distance the speedboat travels from when the engine is switched off until the speedboat stops.
Use 4 strips of equal width.

..... m

(3)

(Total for Question 2 is 7 marks)

- 3** A skier starts from rest at the top of a slope.
The distance-time graph shows the distance, d metres, she has travelled down the slope t seconds after she starts.



- (a) By drawing a tangent, work out an estimate for the speed of the skier 4 seconds after she starts.

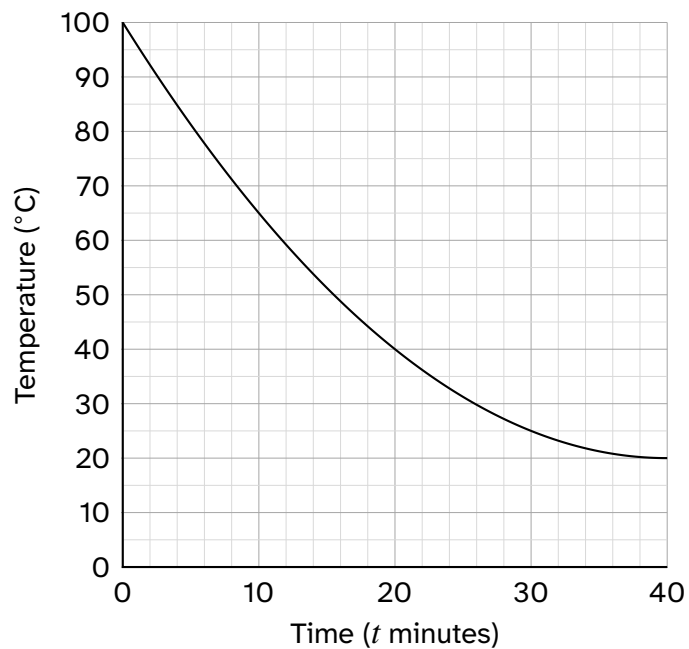
..... m/s
(3)

- (b) Describe how the speed of the skier changes during the 10 seconds.
Give a reason for your answer.

.....
.....
(1)

(Total for Question 3 is 4 marks)

- 4 A cup of hot chocolate is left to cool.
The graph shows the temperature, in $^{\circ}\text{C}$, of the hot chocolate t minutes after it was poured.

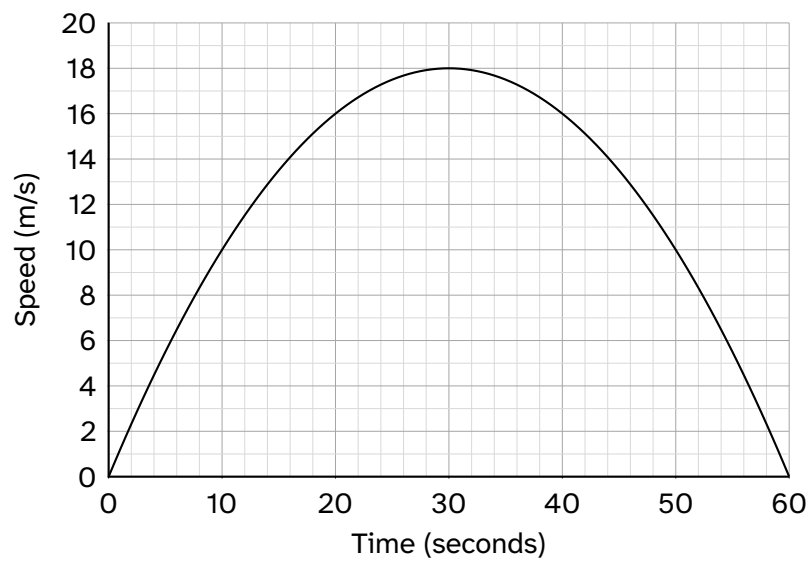


By drawing a tangent, work out an estimate for the rate at which the hot chocolate is cooling 20 minutes after it was poured.
You must show your working.

..... $^{\circ}\text{C}$ per minute
(3)

(Total for Question 4 is 3 marks)

- 5 A tram travels between two stops.
Here is the speed-time graph for the journey.



- (a) Work out an estimate for the distance between the two stops.
Use 3 strips of equal width.

..... m
(3)

- (b) Is your answer to part (a) an underestimate or an overestimate of the actual distance?
Give a reason for your answer.

.....
.....
(1)

- (c) Kareem says,
“The greatest speed of the tram is 18 m/s and the journey takes 60 seconds.
So the distance between the stops is $18 \times 60 = 1080$ m.”
Explain why Kareem is wrong.

(1)

(Total for Question 5 is 5 marks)
