



EXAM PAPERS PRACTICE

GCSE OCR Math J560

Estimating Areas &
Gradients of Graphs

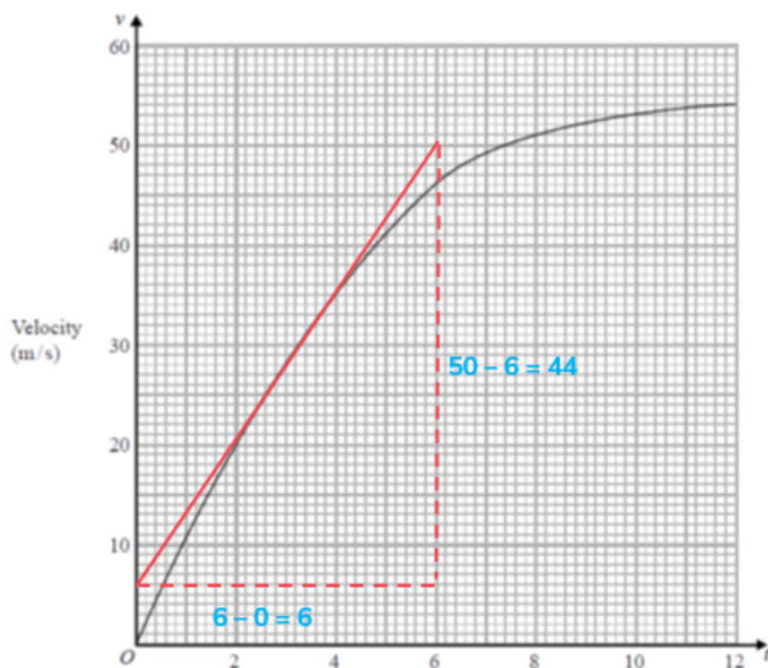
Answers

*"We will help you to
achieve A Star "*



Answer 1

The graph shows information about the velocity of a parachutist after jumping from a plane.



[1] Suitable tangent drawn

- (a) By drawing a suitable tangent, find an estimate of the gradient of the curve after 3 seconds.

Draw a tangent at 3 to calculate gradient = $\frac{\text{RISE}}{\text{RUN}}$

Gradient = $\frac{50-6}{6-0} = \frac{44}{6}$ (see diagram for working)

Gradient = 7.3

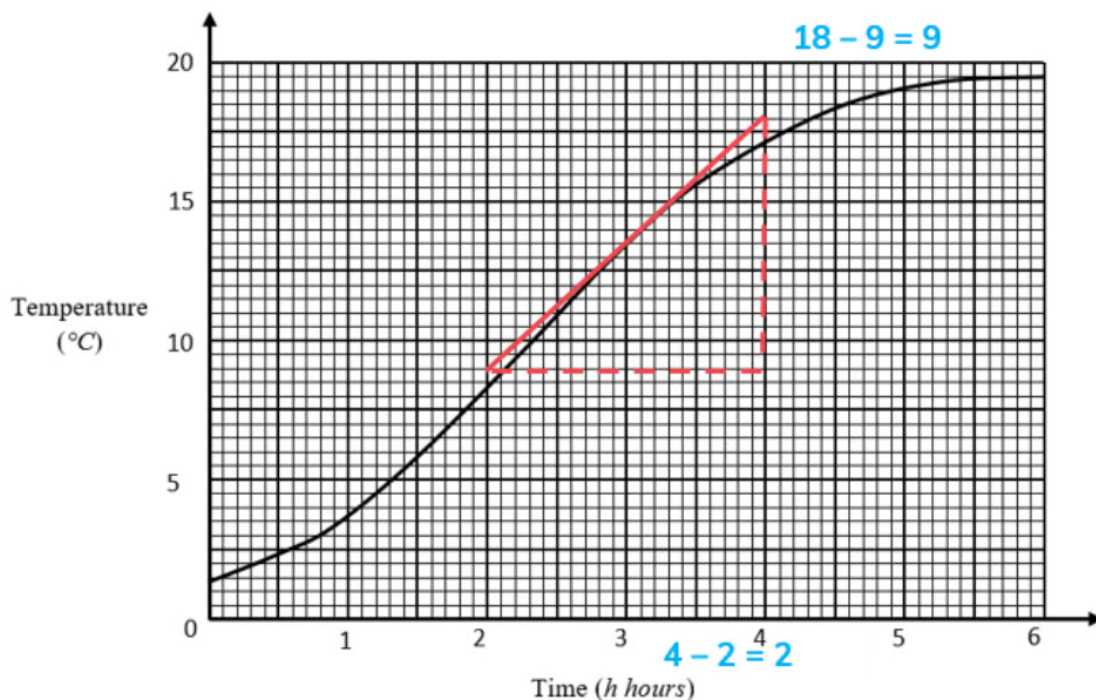
Answers between 6.5 and 7.5 are acceptable as tangents will vary slightly

7.3 [1]



Answer 2

The graph shows the temperature of a fish tank over the first 6 hours after a heater is added.



[1] Suitable tangent drawn

- (a) By drawing a suitable tangent, find an estimate of the gradient of the curve when $h = 3$.

Draw a tangent at 3 to calculate gradient = $\frac{RISE}{RUN}$

Gradient = $\frac{18-9}{4-2} = \frac{9}{2}$ (see diagram for working)

Gradient = 4.5

Answers between 4.1 and 4.9 are acceptable as tangents will vary slightly

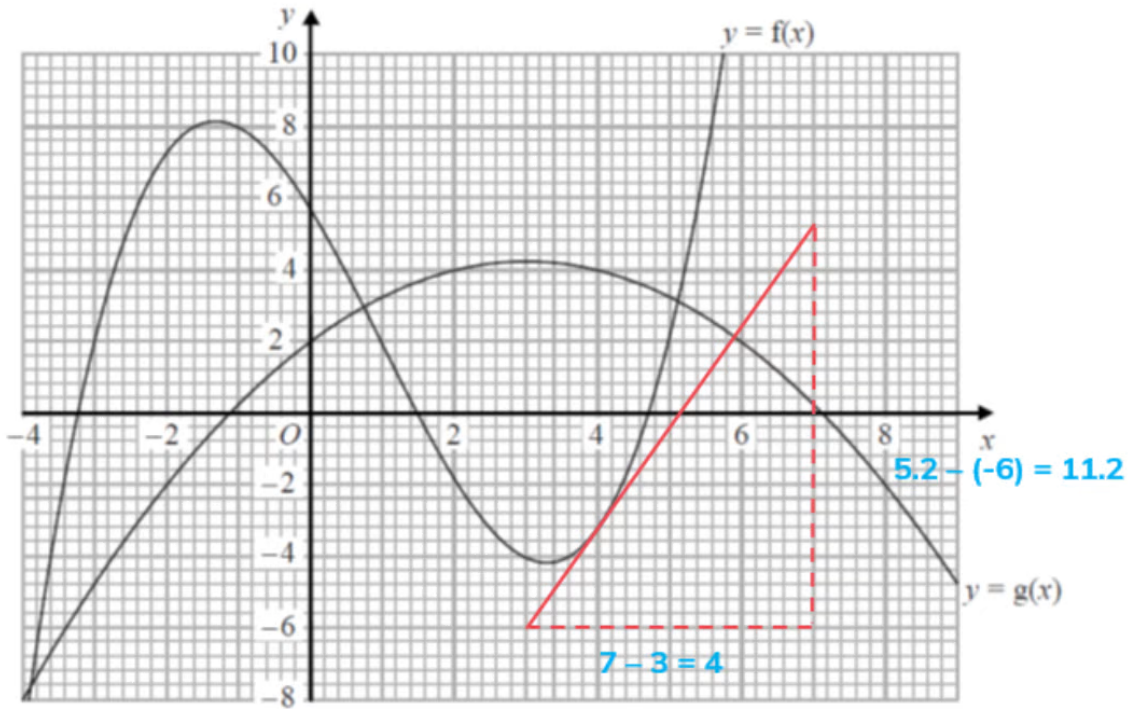
4.5 [1]

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Answer 3

The diagram shows parts of the graphs of $y = f(x)$ and $y = g(x)$.



- (a) Write down the value of x where the gradient of the curve $y = g(x)$ is zero.

The gradient is zero at the turning point of the graph.

$x = 3$ [1]

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Answer 4

- (b) Calculate an estimate for the gradient of the curve $y = f(x)$ at the point on the curve where $x = 4$.

Draw a tangent at 4 to calculate gradient = $\frac{y_2 - y_1}{x_2 - x_1}$

Gradient = $\frac{5.2 - -6}{7 - 3} = \frac{11.2}{4}$ (see diagram for working)

[1] Suitable tangent drawn

Gradient = 2.8

Answers between 2.6 and 3 are acceptable as tangents will vary slightly

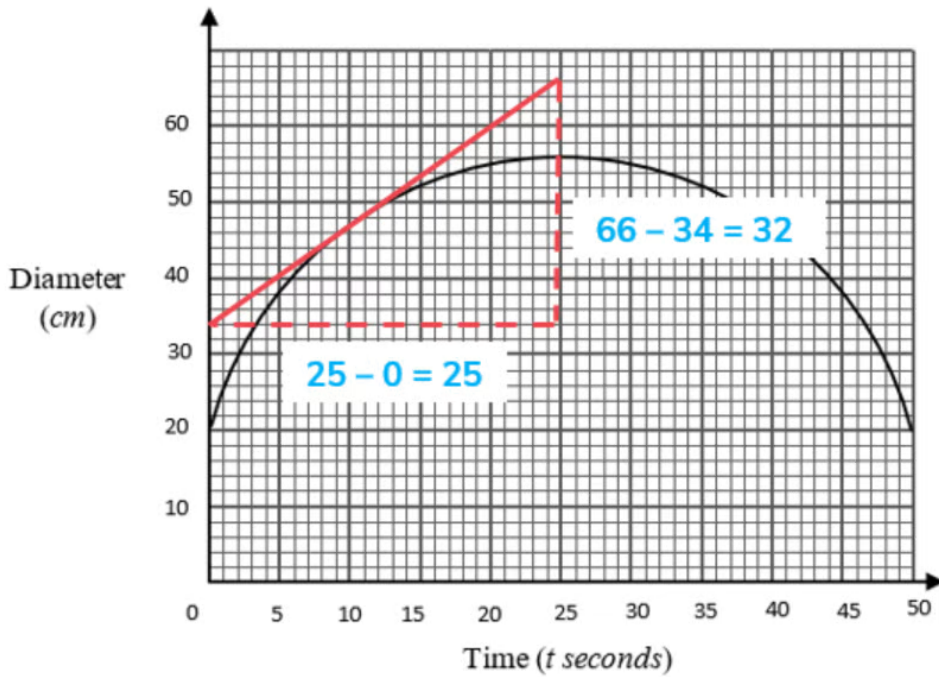
2.8 [1]

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Answer 5

A fish bowl is being filled with water.
The graph shows how the diameter of the surface of the water changes with time.



[1] Suitable tangent drawn

- (a) Find an estimate for the gradient at $t = 10$.

Draw a tangent at 10 to calculate gradient = $\frac{\text{RISE}}{\text{RUN}}$

Gradient = $\frac{66-34}{25-0} = \frac{32}{25}$ (see diagram for working)

Gradient = 1.28

Answers between 1.2 and 1.4 are acceptable as tangents will vary slightly

1.28 [1]

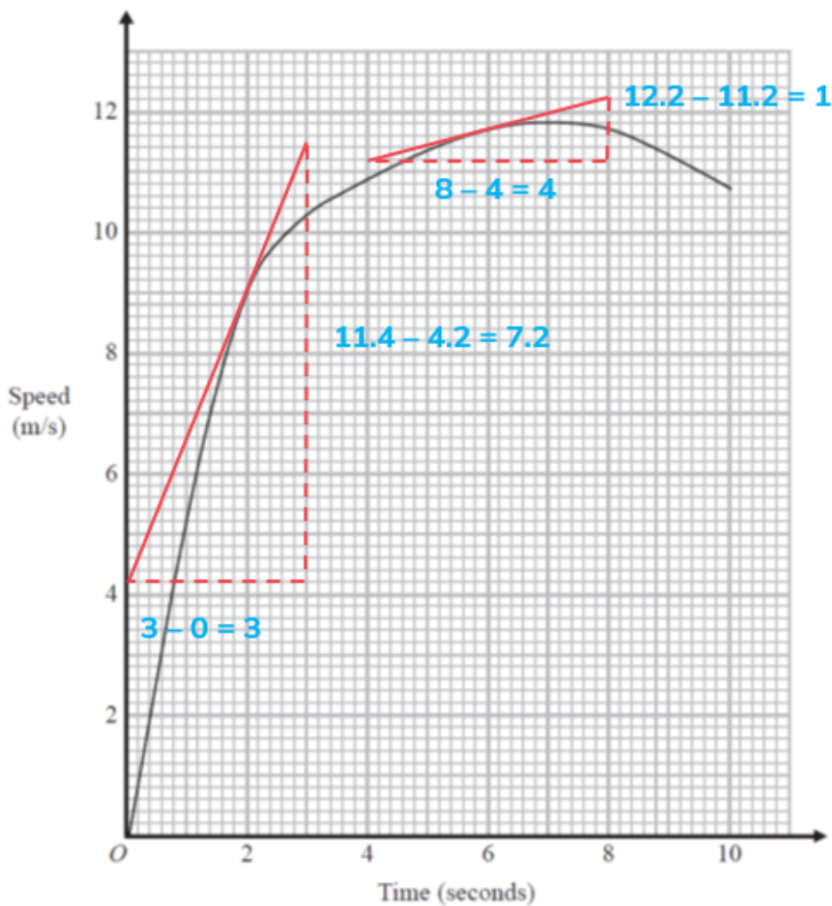
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Answer 6

Olympic medallist Usain runs in a race.

The graph shows his speed, in metres per second (m/s), during the first 10 seconds of the race.



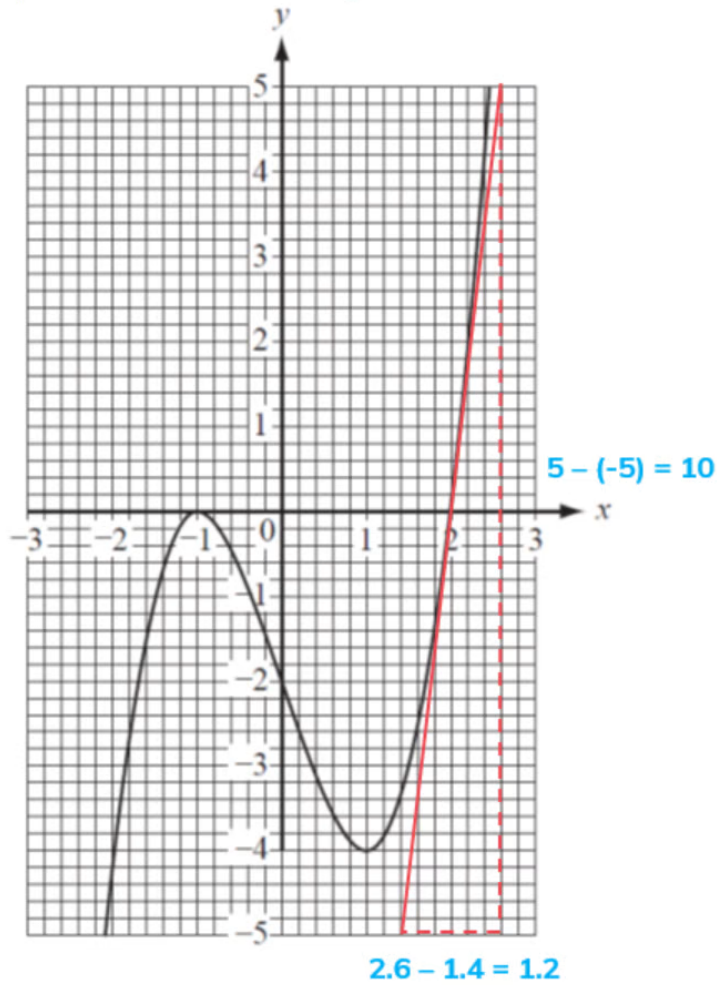
(a) Use the graph to find how long it took Usain to reach his top speed.

The top speed is reached when the graph reaches its highest point or maximum.
6.6 seconds [1]



Answer 7

The curve $y = x^3 - 3x - 2$ is shown on the grid.



- (a) Write down the co-ordinates of the points where the gradient of the curve is zero.

The gradient is zero at the two turning points of the graph.

(-1, 0) and (1, -4) [2]

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Answer 8

- (b) Write down the range of values of x when the gradient of the curve is negative.

The gradient is negative in the middle section between the two turning points of the graph, this is where it slopes downwards.

$$-1 < x < 1 \quad [1]$$

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Answer 9

- (c) Find an estimate of the gradient of the curve when $x = 2$.

Draw a tangent at 2 to calculate gradient = $\frac{y_2 - y_1}{x_2 - x_1}$

[1] Suitable tangent drawn

Gradient = $\frac{5 - -5}{2.6 - 1.4} = \frac{10}{1.2}$ (see diagram for working)

Gradient = 8.3

Answers between 8 and 8.5 are acceptable as tangents will vary slightly

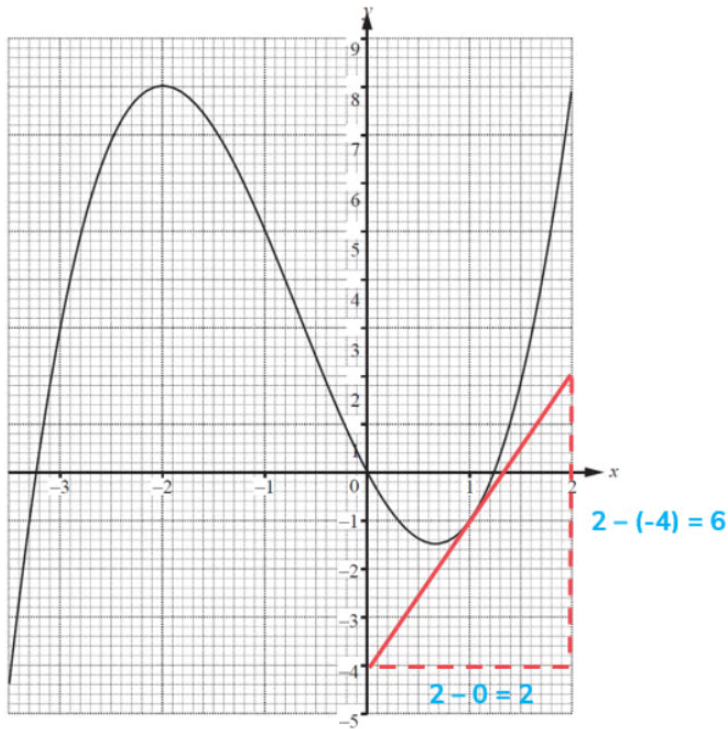
8.3 [1]

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Answer 10

The curve $y = x^3 + 2x^2 - 4x$ is shown on the grid.



[1] Suitable tangent drawn

- (a) By drawing a suitable tangent, find an estimate of the gradient of the curve when $x = 1$.

Draw a tangent at 1 to calculate gradient = $\frac{y_2 - y_1}{x_2 - x_1}$

Gradient = $\frac{2 - (-2)}{2 - 0} = \frac{4}{2}$ (see diagram for working)

[1] Gradient from tangent calculated

Gradient = 3

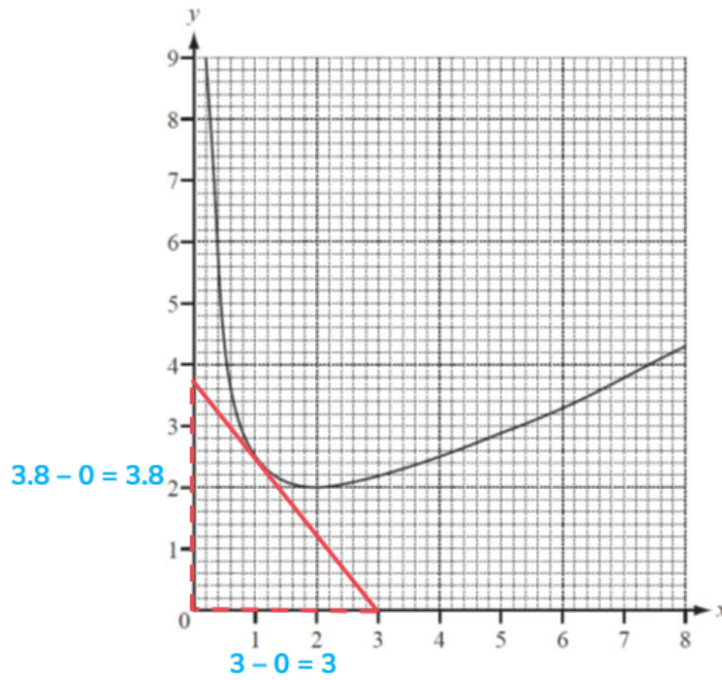
Answers between 2.1 and 3.9 are acceptable as tangents will vary slightly

3 [1]



Answer 11

The diagram shows the graph of $y = \frac{x}{2} + \frac{2}{x}$ for $0 < x \leq 8$.



(a) Use the graph to solve the equation $\frac{x}{2} + \frac{2}{x} = 3$.

Draw a line at $y = 3$ to see where line and curve intersect

[1] Line at $y = 3$

So, the solutions to the equation are

$x = 0.8$ and $x = 5.3$ [1]

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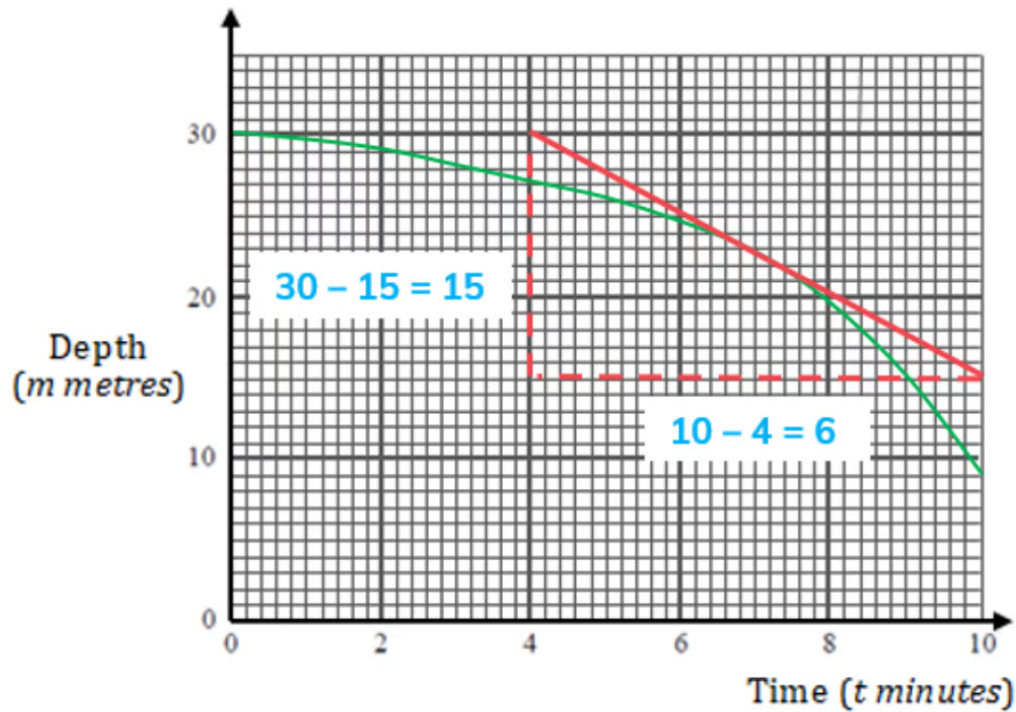


Answer 12

Clare emptied a tank and recorded the depth of water each minute.

Time (<i>t</i> minutes)	0	1	2	3	4	5	6	7	8	9	10
Depth (<i>m</i> metres)	30	29.5	29	28	27	26	24.5	22.5	19.5	15	9

(a) Plot the graph of depth against time.

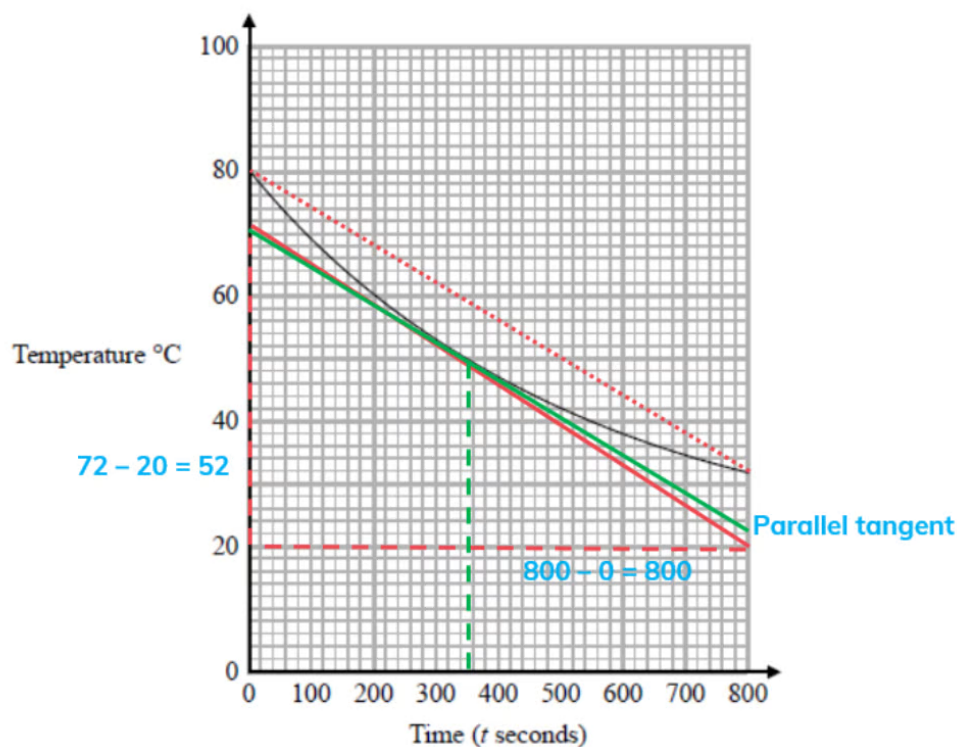


[1] Points plotted accurately
[1] Points joined by a smooth curve



Answer 13

The graph gives information about the variation in the temperature of an amount of water that is left to cool from 80 °C.



- (a) Work out an estimate for the rate of decrease of temperature at $t = 300$.

Draw a tangent at 300 to calculate gradient = $\frac{\text{RISE}}{\text{RUN}}$

[1] Suitable tangent drawn

Gradient is negative as tangent slopes downwards

$$\text{Gradient} = -\frac{72-20}{800-0} = -\frac{52}{800} \quad (\text{see diagram for working})$$

$$\text{Gradient} = -0.065$$

Answers between -0.05 and -0.08 are acceptable as tangents will vary slightly

-0.065 [1]



Answer 14

- (b) Work out the average rate of decrease of the temperature of the water between $t = 0$ and $t = 800$.

Using start and end points from the graph calculate gradient = $\frac{RISE}{RUN}$

Gradient is negative as tangent slopes downwards

$$\text{Gradient} = - \frac{80 - 32}{800 - 0} = - \frac{48}{800}$$

[1] Appropriate values chosen

$$\text{Gradient} = -0.06$$

-0.06 [1]

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Answer 15

The instantaneous rate of decrease of the temperature of the water at time T seconds is equal to the average rate of decrease of the temperature of the water between $t = 0$ and $t = 800$.

- (c) Find an estimate for the value of T .
You must show how you got your answer.

Two points have equal acceleration where their tangents are parallel to each other. Instantaneous acceleration is equal to average acceleration where the tangent to the curve is parallel to the line from $(0, 80)$ to $(800, 32)$.

[1] Suitable tangent drawn

You must draw BOTH lines on the graph to show this.

350 seconds [1]

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