Name:

Exam Style Questions

Rates of Change

Corbettmaths

Ensure you have: Pencil, pen, ruler, protractor, pair of compasses and eraser

You may use tracing paper if needed

Guidance

1. Read each question carefully before you begin answering it.
2. Don't spend too long on one question.
3. Attempt every question.
4. Check your answers seem right.
5. Always show your workings

Revision for this topic

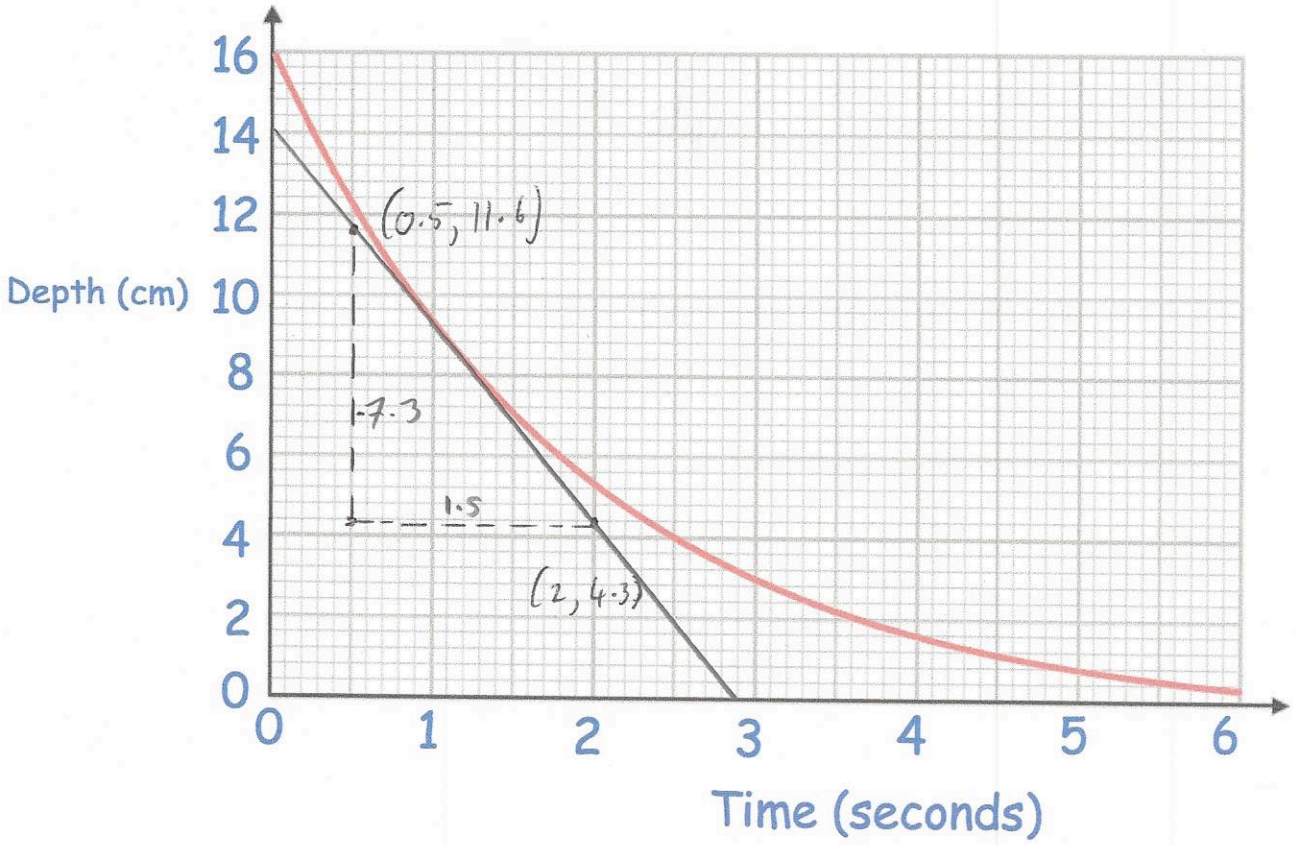
www.corbettmaths.com/contents

Video 390a

Video 390b

* Answers may vary slightly due to tangents

1. Water is being emptied out of a bath.
The graph shows the depth of the water for the first 6 seconds.



Use the graph to work out an estimate of the rate of decrease of depth at 1 second.

gradient = $\frac{\text{rise}}{\text{run}} = \frac{-7.3}{1.5} = -4.86$

rate of decrease = 4.86

4.86 .....cm/s
(3)

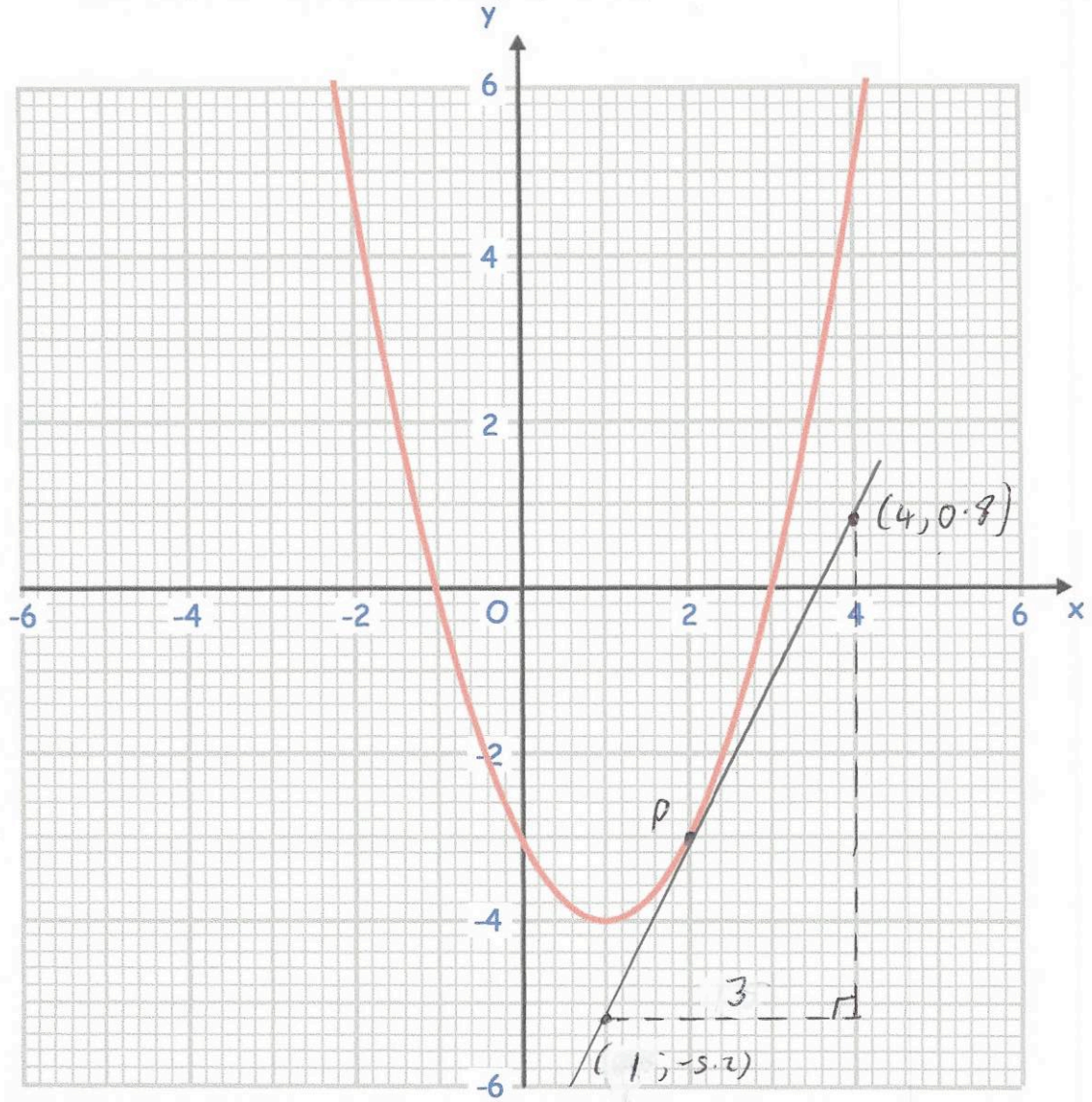
2. A rocket is fired upwards as part of a science experiment.
The graph shows the height of the rocket above the ground.

Work out the average speed between 1 and 4 seconds.

$\frac{\text{rise}}{\text{run}} = \frac{18}{3} = 6 \text{ m/s}$

.....6..... m/s
(3)

3. The diagram shows part of the graph of $y = x^2 - 2x - 3$



P is a point on the graph of $y = x^2 - 2x - 3$ where $x = 2$

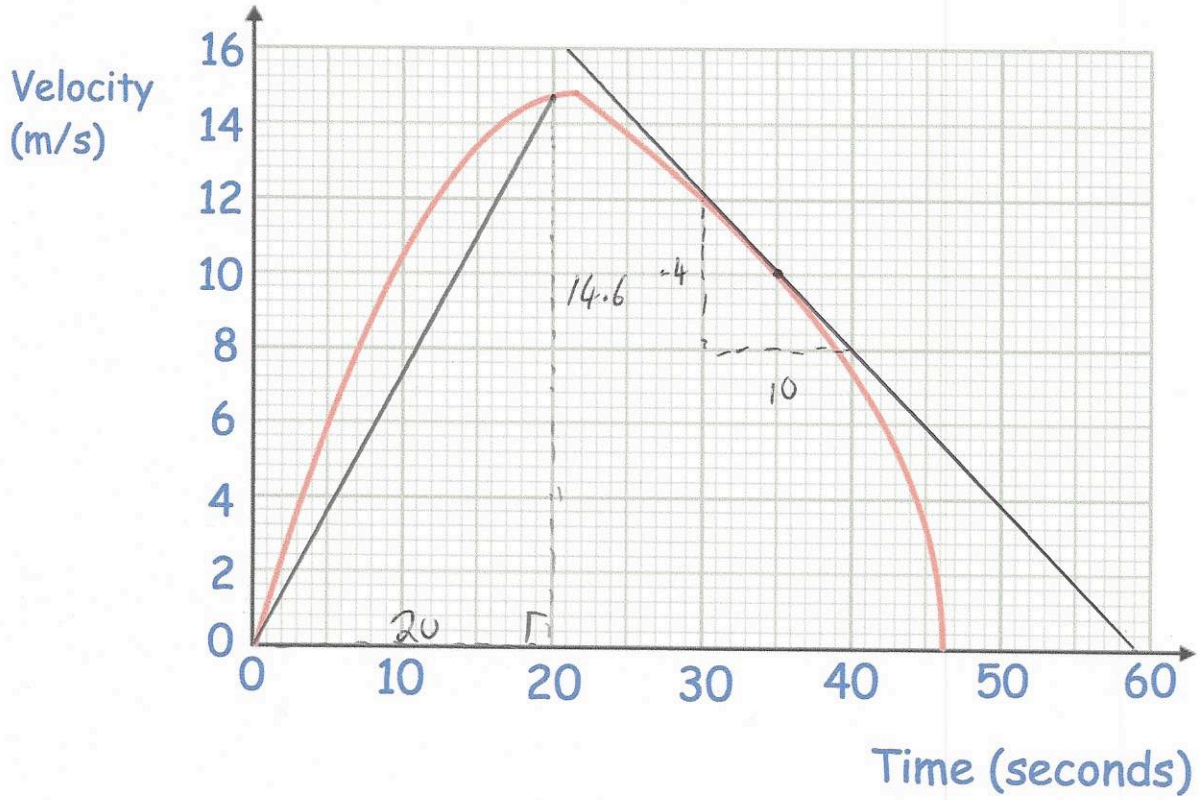
Calculate an estimate for the gradient of the graph at the point P.

gradient = $\frac{\text{rise}}{\text{run}} = \frac{6}{3} = 2$

2

(3)

4. Below is the velocity-time graph of a car journey



(a) Work out the average acceleration over the first 20 seconds of the journey.
State the units of this acceleration.

$\frac{\text{rise}}{\text{run}} = \frac{14.6}{20} = 0.73$

$0.73\ m/s^2$

(4)

(b) Use the graph to calculate an estimate for the deceleration of the car when t = 35 seconds
State the units of this ~~acceleration~~ deceleration.

$\frac{\text{rise}}{\text{run}} = \frac{-4}{10} = -0.4$

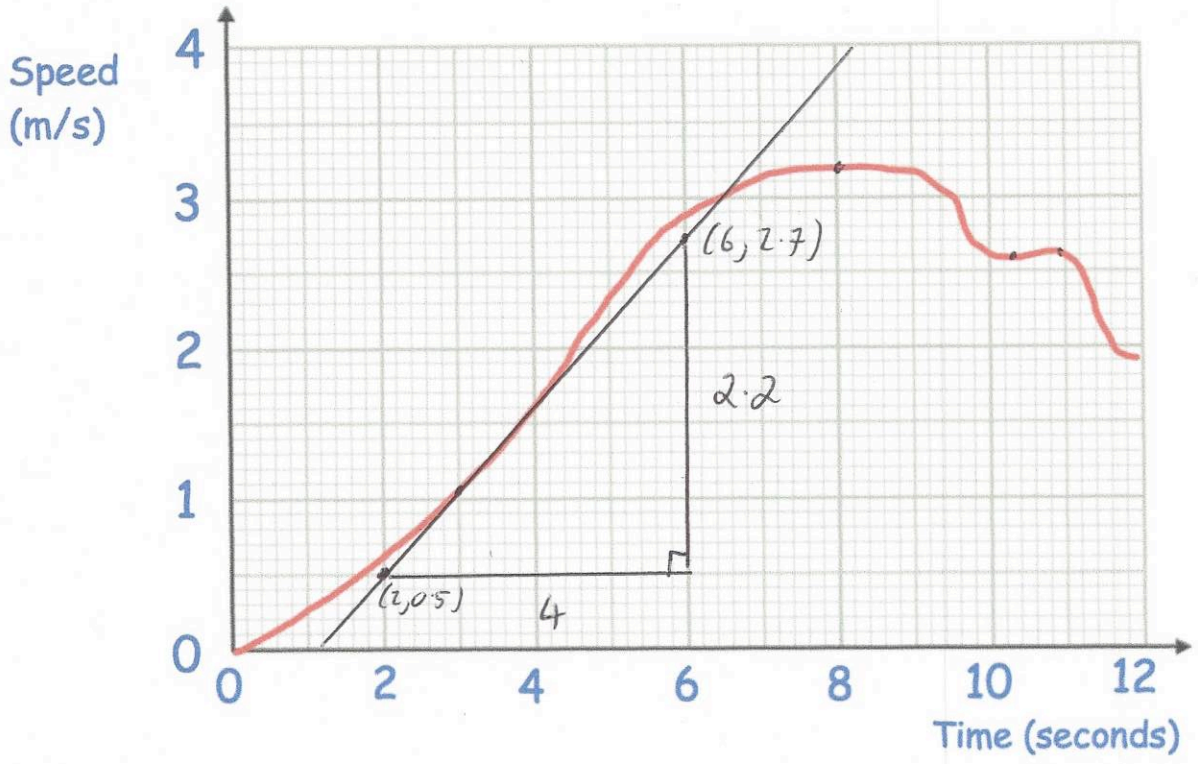
acceleration $= -0.4$

deceleration $= 0.4$

$0.4\ m/s^2$

(4)

5. Some students carry out an experiment.
They record the speed of a toy car during 12 seconds.



(a) Calculate the acceleration of the toy car at 3 seconds.

$\frac{\text{rise}}{\text{run}} = \frac{2.2}{4} = 0.55$

0·55 m/s²

(3)

(b) Write down a time when the toy car was not accelerating.

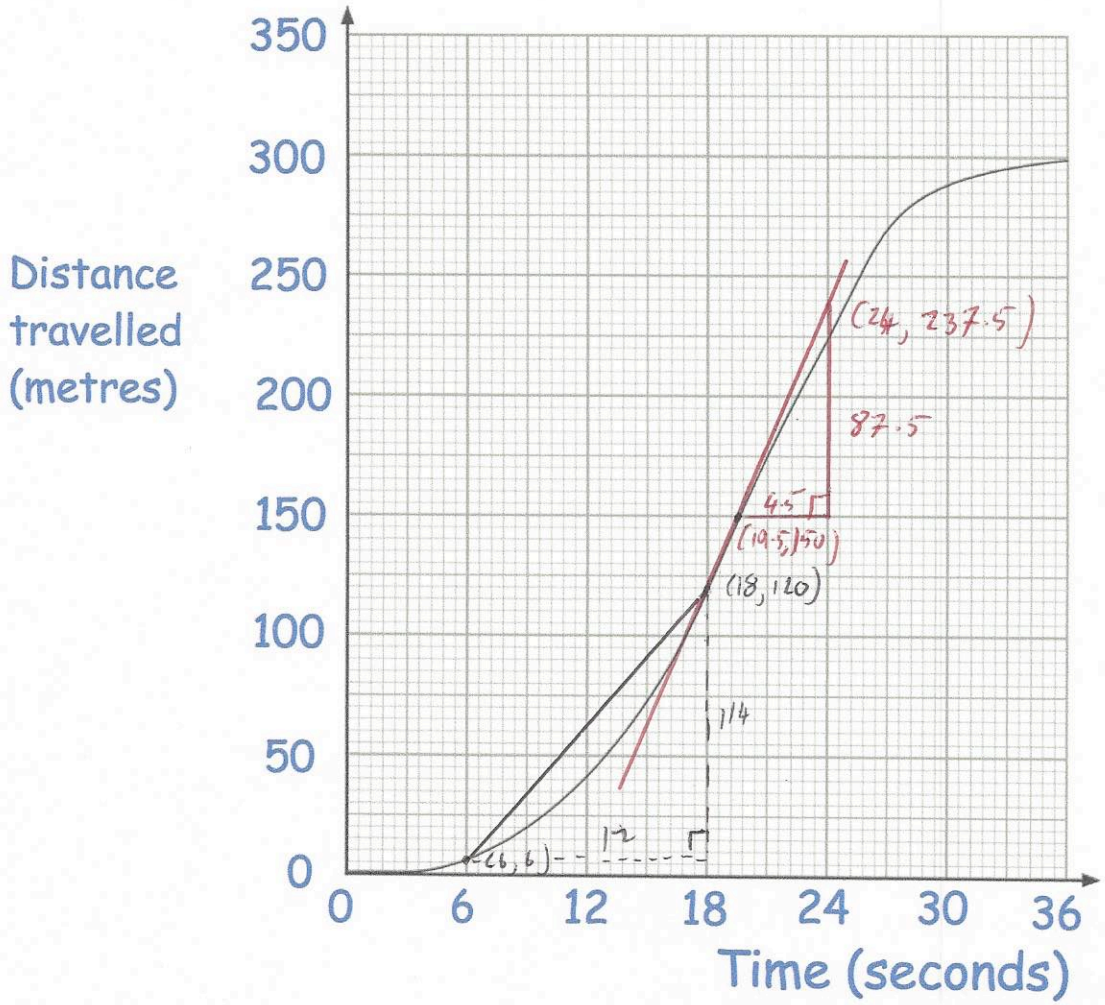
8 seconds

(1)

or 10.3 or 10.9

(approximations)

6. The graph shows the distance travelled by a train over 36 seconds.



(a) Work out the average speed of the train between 6 and 18 seconds.

$\frac{\text{rise}}{\text{run}} = \frac{114}{12} = 9.5$

9.5
.....m/s
(3)

(b) Estimate the highest speed reached by the train on the journey.
Give your answer in kilometres per hour.

* steepest gradient.

$\frac{\text{rise}}{\text{run}} = \frac{87.5}{4.5} = 19.4 \text{ m/s}$

$= 1166.6 \text{ m/min}$

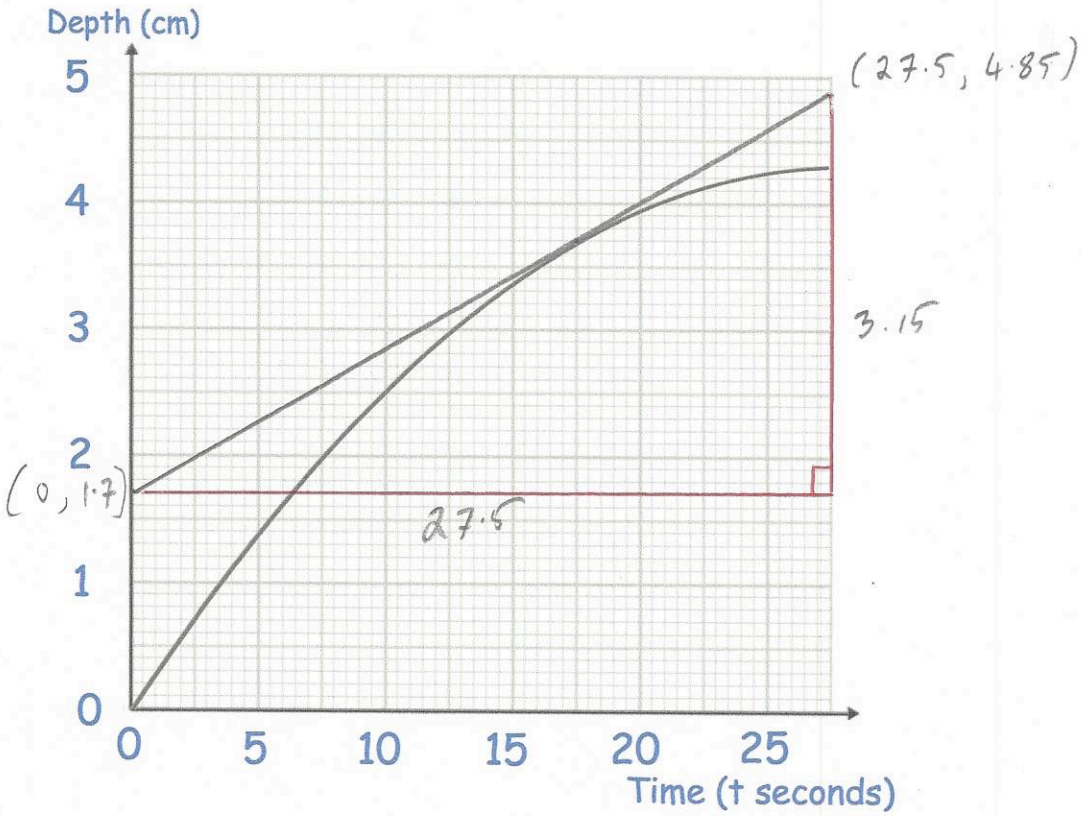
$= 70000 \text{ m/h}$

$= 70 \text{ km/h}$

70
.....km/h
(4)

7. Jack is filling a container with water.

The graph shows the depth of the water, in centimetres, t seconds after the start of filling the container.



(a) Calculate an estimate for the gradient of the graph when t = 15 seconds.

$\frac{\text{rise}}{\text{run}} = \frac{3.15}{27.5} = 0.1145$

0.1145

(3)

(b) Describe fully what your answer to (a) represents

It is the rate at which the depth of the container is increasing. 0.1145 cm per second.

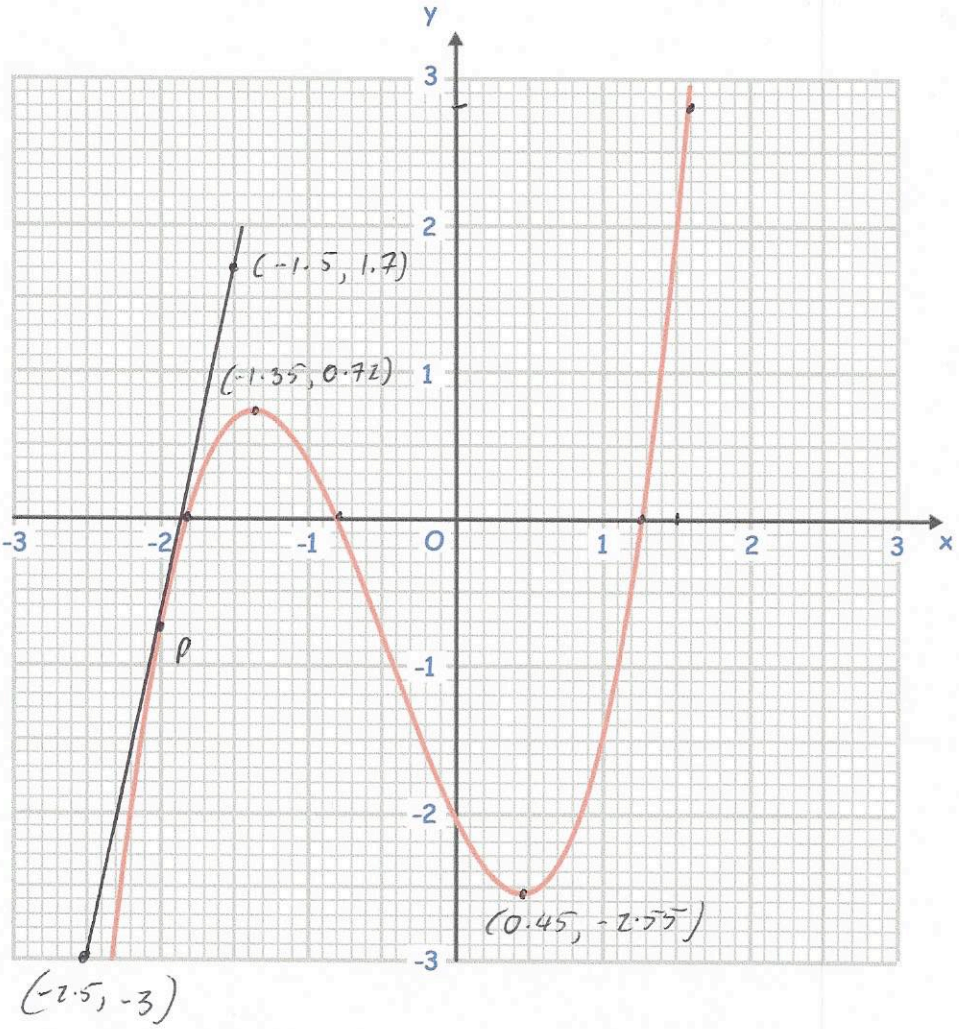
(2)

(c) Explain why your answer to (a) is only an estimate

As it is only a hand-drawn tangent, it will/may not be precise.

(1)

8. The graph of $y = f(x)$ is drawn on the grid.



(a) Write down the coordinates of the two turning points of the graph.

(-1.35, 0.72) and (0.45, -2.55)

(2)

(b) Write down the estimates for the roots of $f(x) = 0$

$x = -1.87$, -0.8 & 1.25

(2)

(c) Use the graph to find f(1.5)

2.8

(1)

P is a point on the graph of $y = f(x)$ where $x = -2$

Calculate an estimate for the gradient of the graph at the point P.

$\frac{\text{rise}}{\text{run}} = \frac{4.7}{1}$

4.7

(3)