AQA – Differentiation – AS Mathematics P2

1. June/2020/Paper_2/No.3

It is given that

$$y = 3x^4 + \frac{2}{x} - \frac{x}{4} + 1$$

Find an expression for $\frac{d^2y}{dx^2}$

[3 marks]

2. June/2020/Paper_2/No.10

A curve has gradient function

$$\frac{dy}{dx} = 3x^2 - 12x + c$$

The curve has a turning point at $(-1, 1)$

(a) Find the coordinates of the other turning point of the curve.

Fully justify your answer.

[6 marks]

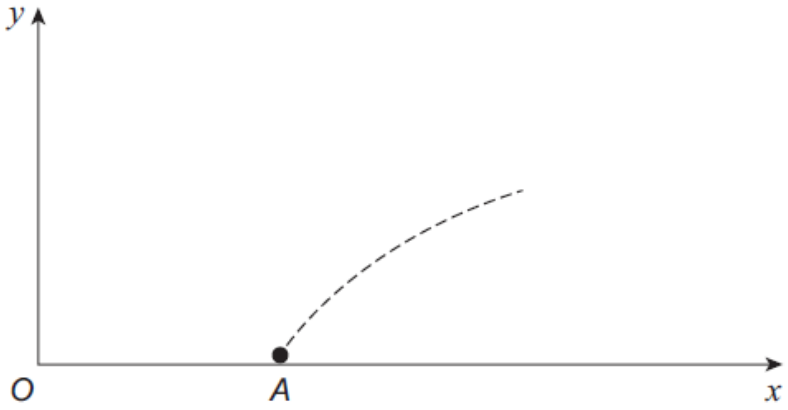
(b) Find the set of values of x for which y is increasing.

[2 marks]

3. June/2020/Paper_2/No.11

A fire crew is tackling a grass fire on horizontal ground.

The crew directs a single jet of water which flows continuously from point *A*.



The path of the jet can be modelled by the equation

$$y = -0.0125x^2 + 0.5x - 2.55$$

where x metres is the horizontal distance of the jet from the fire truck at *O* and y metres is the height of the jet above the ground.

The coordinates of point *A* are $(a, 0)$

(a) (i) Find the value of a.

[3 marks]

(a) (ii) Find the horizontal distance **from *A*** to the point where the jet hits the ground.

[1 mark]

(b) Calculate the maximum vertical height reached by the jet.

[4 marks]

(c) A vertical wall is located 11 metres horizontally from *A* in the direction of the jet. The height of the wall is 2.3 metres.

Using the model, determine whether the jet passes over the wall, stating any necessary modelling assumption.

[3 marks]

4. June/2019/Paper_2/No.1

Find the gradient of the curve $y = e^{-3x}$ at the point where it crosses the y-axis.

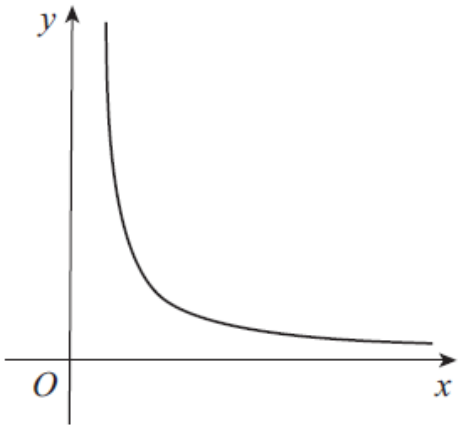
Circle your answer.

[1 mark]

-3 $\quad$ -1 $\quad$ 1 $\quad$ 3

5. June/2019/Paper_2/No.6

A curve has equation $y = \dfrac{2}{x\sqrt{x}}$



The region enclosed between the curve, the x-axis and the lines $x = 1$ and $x = a$ has area 3 units.

Given that $a > 1$, find the value of a.

Fully justify your answer.

[5 marks]

6. June/2019/Paper_2/No.8

A curve has equation

$$y = x^3 + px^2 + qx - 45$$

The curve passes through point R (2, 3)

The gradient of the curve at R is 8

(a) Find the value of p and the value of q.

[5 marks]

(b) Calculate the area enclosed between the normal to the curve at R and the coordinate axes.

[5 marks]

7. June/2019/Paper_2/No.9

A curve C has equation $y = \mathrm{f}(x)$ where

$$\mathrm{f}(x) = (x - 2)(x - 3)^2$$

(a) Find the exact coordinates of the turning points of C.

Determine the nature of each turning point.

Fully justify your answer.

[8 marks]

(b) State the coordinates of the turning points of the curve

$$y = \mathrm{f}(x + 1) - 4$$

[2 marks]