Mixed Exam Questions – Week 9

Suggested time: 35 minutes

Question	1	2	3	4	5	6	7	8	9	Total
Marks										
Max Marks	1	4	3	4	1	1	4	2	6	27

1.

The curve $y = \sqrt{x}$ is translated onto the curve $y = \sqrt{x} + 4$

The translation is described by a vector.

Find this vector.

Circle your answer.

[1 mark]

$$\begin{bmatrix} 4 \\ 0 \end{bmatrix} \qquad \begin{bmatrix} -4 \\ 0 \end{bmatrix} \qquad \begin{bmatrix} 0 \\ 4 \end{bmatrix} \qquad \begin{bmatrix} 0 \\ -4 \end{bmatrix}$$

2.   **(a)**   Write down the value of p and the value of q given that:

(a) (i) $\sqrt{3} = 3^p$

[1 mark]

(a) (ii) $\dfrac{}{9} = 3^q$

[1 mark]

(b)   Find the value of x for which $\sqrt{3} \times 3^x = \dfrac{1}{9}$

[2 marks]

3.

Show that $\dfrac{5\sqrt{2} + 2}{3\sqrt{2} + 4}$ can be expressed in the form $m + n\sqrt{2}$, where m and n are integers.

[3 marks]

4.

Determine whether the line with equation $2x + 3y + 4 = 0$ is parallel to the line through the points with coordinates (9, 4) and (3, 8).

[4 marks]

5.

$p(x) = x^3 - 5x^2 + 3x + a$, where a is a constant.

Given that $x - 3$ is a factor of p(x), find the value of a

Circle your answer.

[1 mark]

-9 $\qquad\qquad$ -3 $\qquad\qquad$ 3 $\qquad\qquad$ 9

6.

The graph of $y = f(x)$ is shown in **Figure 1**.

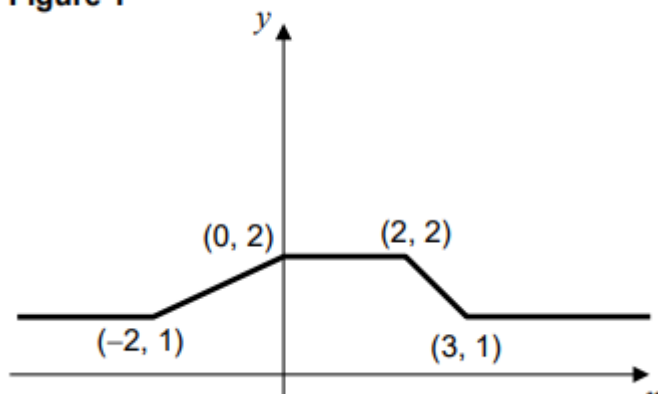State the equation of the graph shown in **Figure 2**.

Figure 1

(0, 2)   (2, 2)
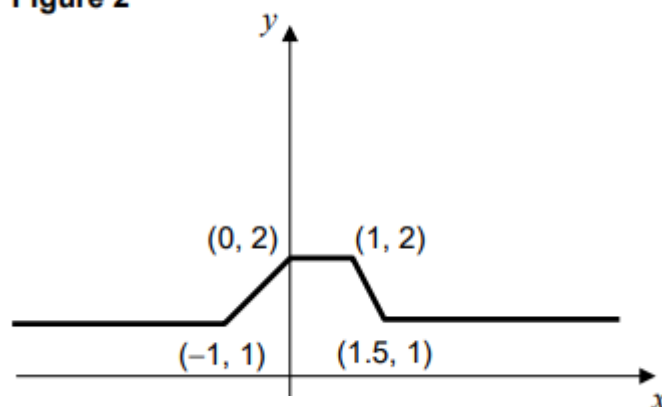
(−2, 1)   (3, 1)

Figure 2

(0, 2)   (1, 2)

(−1, 1)   (1.5, 1)

Circle your answer.

[1 mark]

$$y = f(2x) \qquad y = f\left(\frac{x}{2}\right) \qquad y = 2f(x) \qquad y = \frac{1}{2}f(x)$$

7.

The quadratic equation $3x^2 + 4x + (2k - 1) = 0$ has real and distinct roots.

Find the possible values of the constant k

Fully justify your answer.

[4 marks]

8. (a)

The unit vectors **i** and **j** are perpendicular.

Find the magnitude of the vector −20**i** + 21**j**

Circle your answer.

[1 mark]

$$-1 \qquad\qquad 1 \qquad\qquad \sqrt{41} \qquad\qquad 29$$

(b)

The angle between the vector **i** and the vector −20**i** + 21**j** is θ

Which statement about θ is true?

Circle your answer.

$$0° < \theta < 45° \qquad 45° < \theta < 90° \qquad 90° < \theta < 135° \qquad 135° < \theta < 180°$$ [1 mark]

9.

A toy train travels on a straight track, of length 11 metres.

It is initially at rest with the back of the train at one end of the track.

It accelerates uniformly for 8 seconds and reaches a speed of 2 m s⁻¹.

It then travels at this speed until it reaches the end of the track.

(a)   Sketch a velocity-time graph for the train.

[2 marks]

(b)   Find the time it takes the train to reach the end of the track.

[2 marks]

(c) (i) Describe how the model that you have used could be refined.

[1 mark]

(c) (ii) Explain how your refinement would affect your answer to part **(b)**.

[1 mark]