Mixed Exam Questions – Week 8

Question	1	2	3	4	5	6	7	8	9	Total
Marks										
Max Marks	4	3	4	9	3	4	10	2	5	44

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

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

(1)

(ii) $\frac{1}{9} = 3^q$

(1)

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

(2)

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

(3)

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

(4)

4.

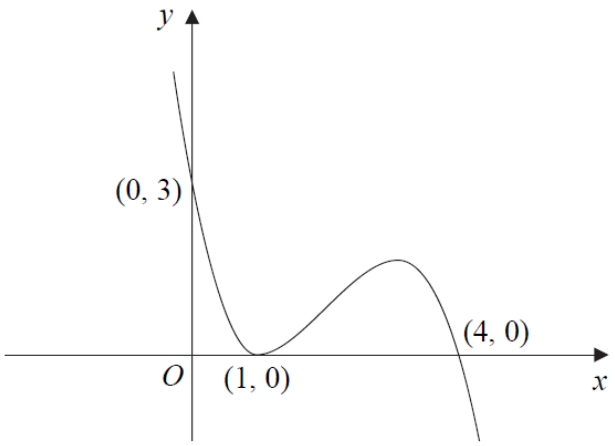


Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve passes through the points $(0, 3)$ and $(4, 0)$ and touches the x-axis at the point $(1, 0)$.

On separate diagrams sketch the curve with equation

(a) $y = f(x + 1)$,

(3)

(b) $y = 2f(x)$,

(3)

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

On each diagram clearly show the coordinates of all the points where the curve meets the axes.

(3)

5. Simplify $\frac{(4x^5y)^3}{(2xy^2) \times (8x^{10}y^4)}$.

(3)

6. 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)

7. The line l_1 passes through the point $(9, -4)$ and has gradient $\frac{1}{3}$,

(a) Find an equation for l_1 in the form $ax + by + c = 0$, where a, b and c are integers.

(3)

The line l_2 passes through the origin O and has gradient -2. The lines l_1 and l_2 intersect at the point P.

(b) Calculate the coordinates of P.

(4)

Given that l_1 crosses the y-axis at the point C,

(c) calculate the exact area of ΔOCP.

(3)

8. (a) The unit vectors **i** and **j** are perpendicular.

Find the magnitude of the vector $-20\mathbf{i} + 21\mathbf{j}$.

Circle your answer.

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

(1)

(b) The angle between the vector **i** and the vector $-20\mathbf{i} + 21\mathbf{j}$ is θ.

Which statement about θ is true?

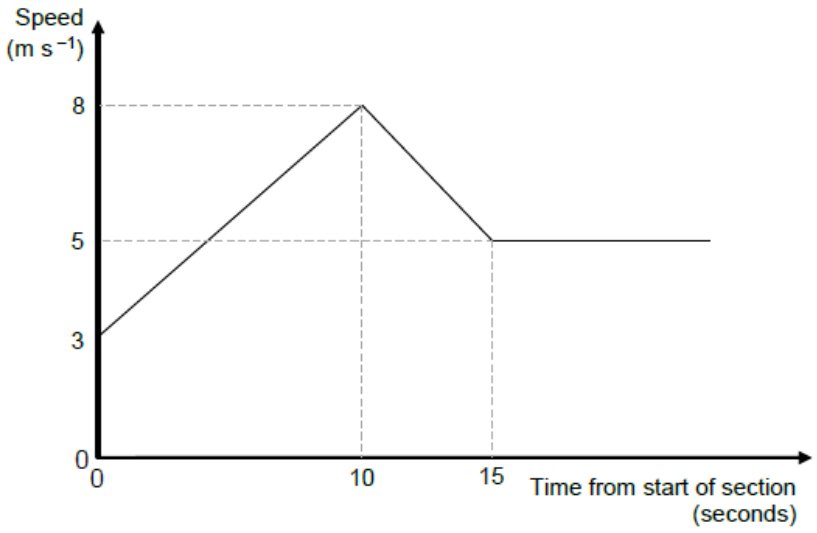
Circle your answer.

$0° < \theta < 45°$ $\quad$ $45° < \theta < 90°$ $\quad$ $90° < \theta < 135°$ $\quad$ $135° < \theta < 180°$

(1)

9. The graph shows how the speed of a cyclist varies during a timed section of length 120 m along a straight track.

(a) Find the acceleration of the cyclist during the first 10 seconds.



(1)

(b) After the first 15 seconds, the cyclist travels at a constant speed of 5 ms^{-1} for a further T seconds to complete the 120 m section.

Calculate the value of T.

(4)