

Year 1 – Week 12 Exam Questions

Question	1	2	3	4	5	6	7	8	Total
Marks									
Max Marks	3	4	6	4	7	10	4	7	45

Suggested time: 55 minutes

Q1. The line l passes through the points $A(3, 1)$ and $B(4, -2)$.

Find an equation for l .

(3)

Q2 Given that the point A has position vector $3\mathbf{i} - 7\mathbf{j}$ and the point B has position vector $8\mathbf{i} + 3\mathbf{j}$,

(a) find the vector \overrightarrow{AB}

(2)

(b) Find $|\overrightarrow{AB}|$. Give your answer as a simplified surd.

(2)

Q3

$$f(x) = 4x^3 - 12x^2 + 2x - 6$$

(a) Use the factor theorem to show that $(x - 3)$ is a factor of $f(x)$.

(2)

(b) Hence show that 3 is the only real root of the equation $f(x) = 0$

(4)

Q4

The equation $kx^2 + 4kx + 3 = 0$, where k is a constant, has no real roots.

Prove that

$$0 \leq k < \frac{3}{4}$$

(4)

Q5 A circle C with centre at $(-2, 6)$ passes through the point $(10, 11)$.

(a) Show that the circle C also passes through the point $(10, 1)$.

(3)

The tangent to the circle C at the point $(10, 11)$ meets the y axis at the point P and the tangent to the circle C at the point $(10, 1)$ meets the y axis at the point Q .

(b) Show that the distance PQ is 58 explaining your method clearly.

(7)

Q6 (a) Factorise completely $x^3 + 10x^2 + 25x$ (2)

(b) Sketch the curve with equation

$$y = x^3 + 10x^2 + 25x$$

showing the coordinates of the points at which the curve cuts or touches the x -axis. (2)

The point with coordinates $(-3, 0)$ lies on the curve with equation

$$y = (x + a)^3 + 10(x + a)^2 + 25(x + a)$$

where a is a constant.

(c) Find the two possible values of a . (3)

Q7

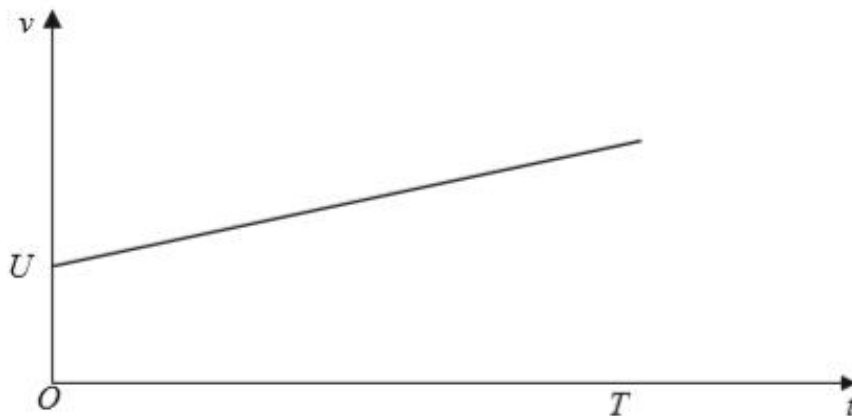


Figure 1

A car moves along a straight horizontal road. At time $t = 0$, the velocity of the car is $U \text{ m s}^{-1}$. The car then accelerates with constant acceleration $a \text{ m s}^{-2}$ for T seconds. The car travels a distance D metres during these T seconds.

Figure 1 shows the velocity-time graph for the motion of the car for $0 \leq t \leq T$.

Using the graph, show that $D = UT + \frac{1}{2} aT^2$.

(No credit will be given for answers which use any of the kinematics (*suvat*) formulae listed under Mechanics in the AS Mathematics section of the formulae booklet.) (4)

Q8

A car is moving along a straight horizontal road with constant acceleration. There are three points A , B and C , in that order, on the road, where $AB = 22 \text{ m}$ and $BC = 104 \text{ m}$. The car takes 2 s to travel from A to B and 4 s to travel from B to C .

Find

(i) the acceleration of the car,

(ii) the speed of the car at the instant it passes A .

(7)