Cambridge International AS & A Level

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Mathematics 9709/12

Paper 1 Pure Mathematics 1 **October/November 2024**

Question No(1)

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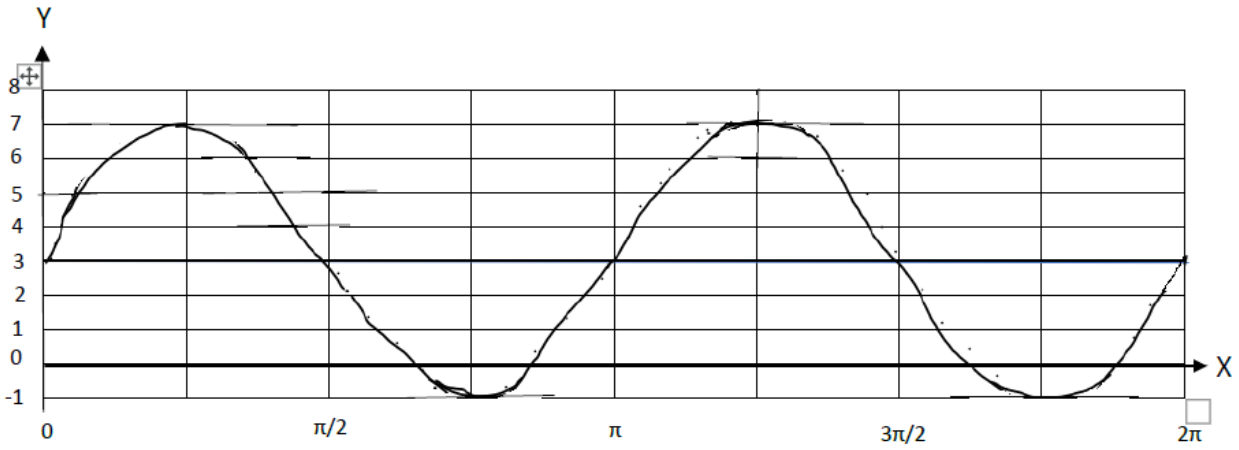


The diagram shows the curve with equation $\boldsymbol{y = a\,sin(bx) + c \;\; for\; 0 \leq x \leq 2\pi}$

where a, b and c are positive constants.

(a) State the values of a, b and c

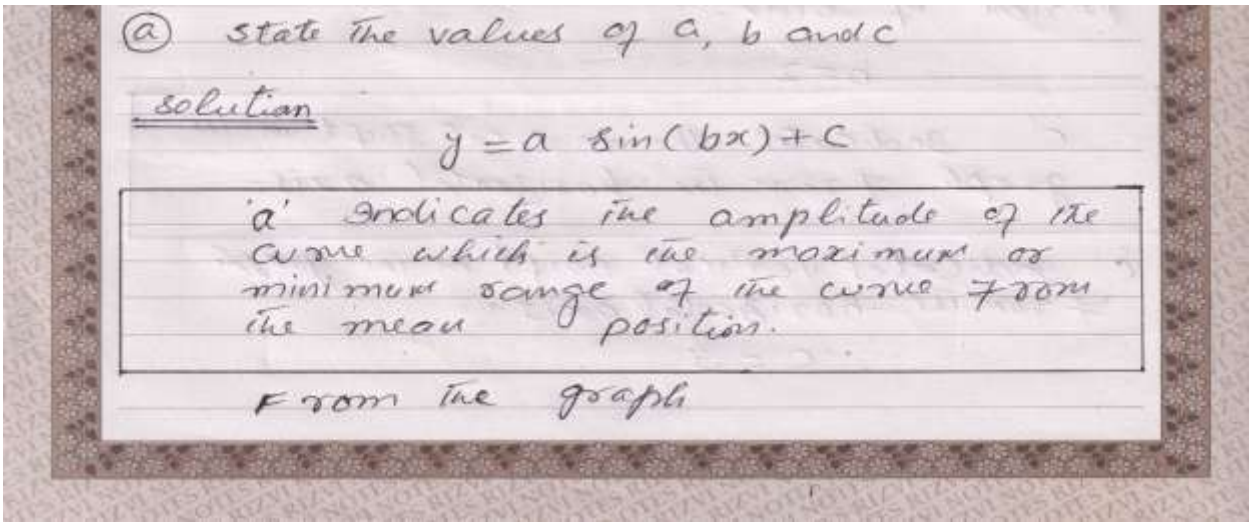
(b) For these values of a, b and c, determine the number of solutions in the interval

$0 \leq x \leq 2\pi$ for each of the following equations:

(i) $\boldsymbol{a\,sin(bx) + c = 7 - x}$

(ii) $\boldsymbol{a\,sin(bx) + c = 2\pi\,(x - 1)}$

Solution:



(2)

mean position is at 3.

maximum value from graph is 7.

a = amplitude of the curve.

∴ from graph

$a = 7 - 3$

$= 4$

In the given equation

$y = a \sin(bx) + c$

'b' indicates the periodicity of the curve

As there are two cycles in the normal period of sine.

∴ $b = 2$

'c' indicates the vertical shift in the graph from the horizontal axis.

'c' indicates vertical shift in the graph from the horizontal axis.

∴ $c = 3$

DATE :-

(b) For these values of a, b and c, determine the number of solutions in the interval $0 \le x \le 2\pi$ for each of the following equations:

(i) $a\sin(bx) + c = 7 - x$

Solution

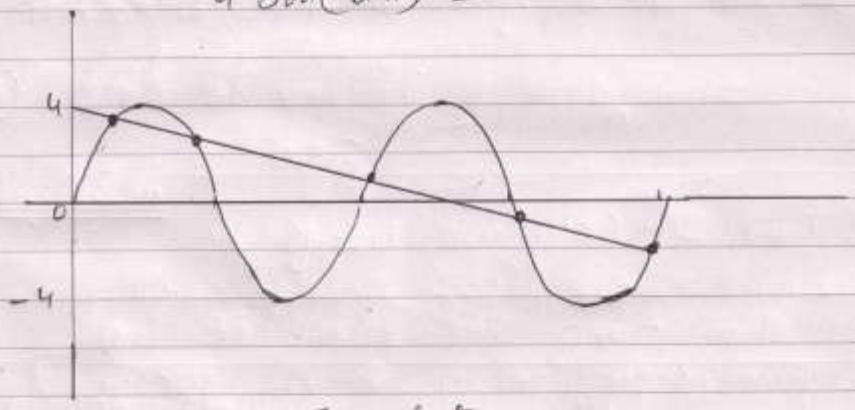
$a\sin(bx) + c = 7 - x$

As $a = 4, b = 2, c = 3$

$\Rightarrow 4\sin(2x) + 3 = 7 - x$

$4\sin(2x) = 7 - x - 3$

$4\sin(2x) = 4 - x$

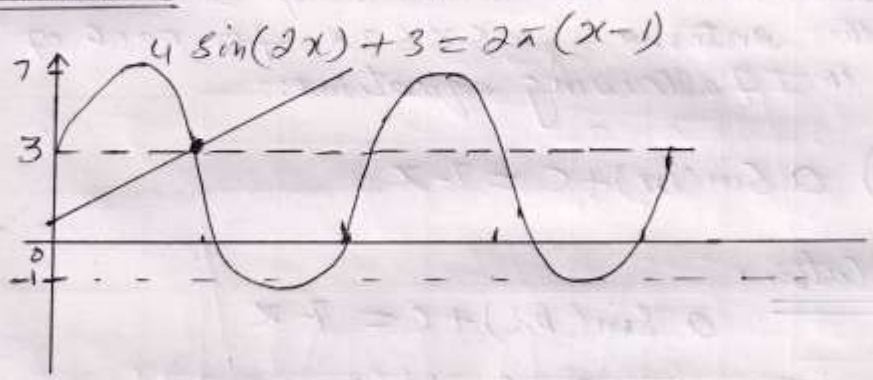


5 solutions

(4)

(ii) $a \sin(bx) + c = 2\pi(x-1)$

Solution



There is one solution ie at $x = \pi/2$.