

Question 5 ✓

(1.2)

(25 marks)

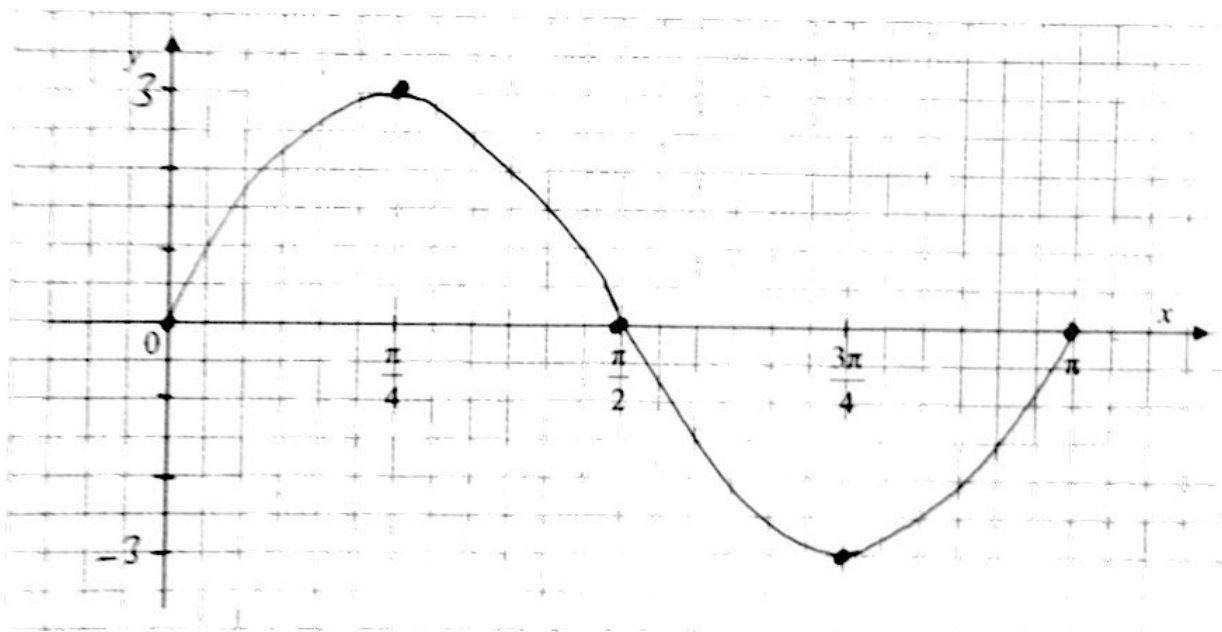
The function  $f : x \mapsto 3 \sin(2x)$  is defined for  $x \in \mathbb{R}$ .

(a) Complete the table below

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PAPER 2

$x$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	$\pi$
$2x$	0	$\frac{\pi}{2}$	$\pi$	$\frac{3\pi}{2}$	$2\pi$
$\sin(2x)$	0	1	0	-1	0
$3\sin(2x)$	0	3	0	-3	0

(b) Draw the graph of  $y = f(x)$  in the domain  $0 \leq x \leq \pi$ ,  $x \in \mathbb{R}$ .



(c) Write down the range and the period of  $f$ .

Range =  $[-3, 3]$

Period =  $\pi$

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# ALGEBRA HW ③ SOLUTIONS

① (i) NO REAL ROOTS (F)

TWO SAME, REAL ROOTS (g)

TWO DIFFERENT, REAL ROOTS (h)

(ii) EQUAL ROOTS  $\Rightarrow b^2 - 4ac = 0$

$$\therefore (1-k)^2 - 4(k)(k) = 0$$

$$\therefore 1 - 2k + k^2 - 4k^2 = 0$$

$$\therefore 1 - 2k - 3k^2 = 0$$

$$\therefore 0 = 3k + 2k - 1$$

$$\therefore 0 = (3k - 1)(k + 1)$$

$$\boxed{k = \frac{1}{3}} \text{ or } \boxed{k = -1}$$

$$\begin{aligned} \textcircled{2} \quad \frac{x^2 + 4}{(x-2)(x+2)} - \frac{x}{x+2} &= \frac{x^2 + 4 - x(x-2)}{(x-2)(x+2)} \\ &= \frac{x^2 + 4 - x^2 + 2x}{(x-2)(x+2)} = \frac{2x + 4}{(x-2)(x+2)} = \frac{2(x+2)}{(x-2)(x+2)} \\ &= \boxed{\frac{2}{x-2}} \end{aligned}$$

$$\textcircled{3} \quad (x-p)(x+p) = x^2 - p^2$$

$$\therefore (x^2 - p^2)(ax - \frac{d}{p^2}) = ax^3 + bx^2 + cx + d$$

$$\therefore ax^3 - \frac{d}{p^2}x^2 - p^2ax + d = ax^3 + bx^2 + cx + d$$

$$\left. \begin{array}{l} \frac{x^2 \text{ coeff}}{-\frac{d}{p^2} = b} \end{array} \right\}$$

$$\left. \begin{array}{l} \frac{x \text{ coeff}}{-ap^2 = c} \end{array} \right\}$$

$$\Rightarrow bc = \left(-\frac{d}{p^2}\right)(-ap^2)$$

$$= ad$$