Question 5 **(25 marks)**

(a) Solve the equation $\cos 3\theta = \frac{1}{2}$, for $\theta \in \mathbb{R}$, (where θ is in radians).

$\cos 3\theta = \frac{1}{2}$

$R = \frac{\pi}{3}$ (60°) π | S (A) | T (C)

$1^{st} = \frac{\pi}{3}$, $4^{th} = 2\pi - \frac{\pi}{3} = \frac{5\pi}{3}$

$3\theta = \frac{\pi}{3} + 2n\pi$ $\quad$ $3\theta = \frac{5\pi}{3} + 2n\pi$

$\theta = \frac{\pi}{9} + \frac{2n\pi}{3}$ $\quad$ $\theta = \frac{5\pi}{9} + \frac{2n\pi}{3}$

$n=0$ $\quad \theta = \frac{\pi}{9}$ $\quad \theta = \frac{5\pi}{9}$

$n=1$ $\quad \theta = \frac{\pi}{9} + \frac{2\pi}{3} = \frac{7\pi}{9}$ $\quad \theta = \frac{5\pi}{9} + \frac{2\pi}{3} = \frac{11\pi}{9}$

$n=2$ $\quad \theta = \frac{\pi}{9} + \frac{4\pi}{3} = \frac{13}{9}\pi$ $\quad \theta = \frac{5\pi}{9} + \frac{4\pi}{3} = 17/9\,\pi$

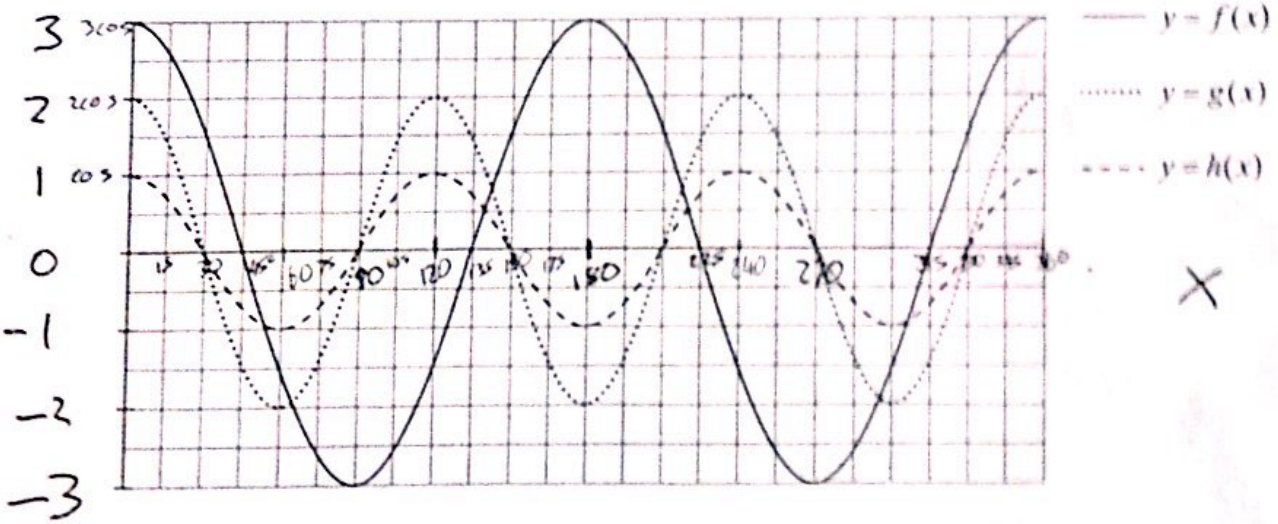
(b) The graphs of three functions are shown on the diagram below. The scales on the axes are not labelled. The three functions are:

$x \to \cos 3x$

$x \to 2\cos 3x$

$x \to 3\cos 2x$

Identify which function is which, and write your answers in the spaces below the diagram.



$f: x \to$ 3cos 2x $\quad g: x \to$ 2 cos 3x $\quad h: x \to$ cos 3x

(c) Label the scales on the axes in the diagram in part **(b)**.