Let's rearrange the desks into a Unit Circle.

Today's learning objective:

By the end of class, I will be able to understand what a trigonometric curve might look like before graphing it.

Today's language objective:

Period
Amplitude

Consider $g(x) = -\cos 2x$

(a) Write down the period of g.

non-calc

$P = \frac{2\pi}{b}$

.....

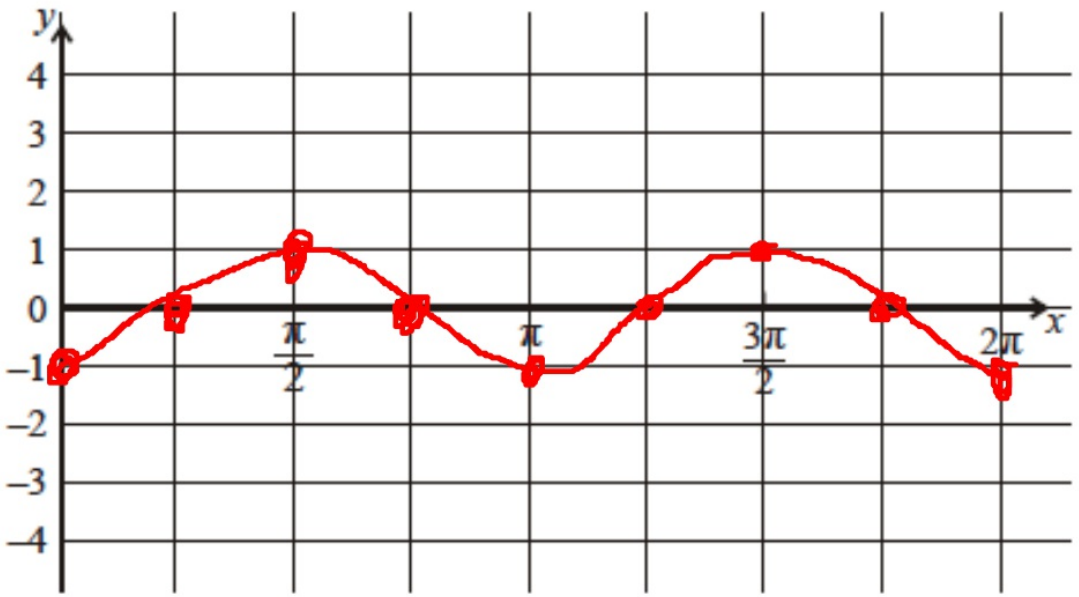
π

.....

.....

(1

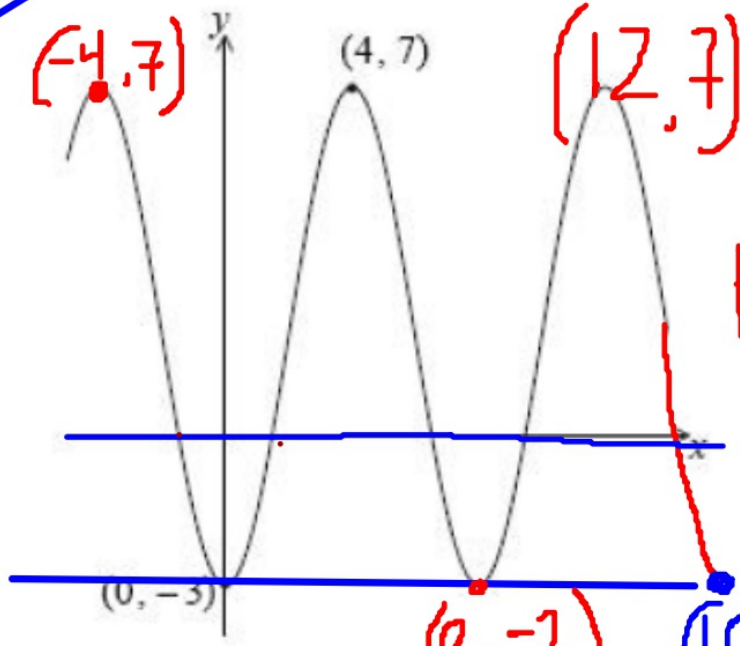
(b) On the diagram below, sketch the curve of $g'(x)$, for $0 \leq x \leq 2\pi$.



(5)

(c) Write down the number of solutions to the equation $g(x) = -2$, for $0 \leq x \leq 2\pi$. (1)

3.) The graph of $y = p\cos qx + r$, for $-5 \leq x \leq 14$, is shown below.



amplitude

(−4, 7) (12, 7) non-calc

$p = \frac{2\pi}{b}$

$8 = \frac{2\pi}{b}$

(8, −3) (16, −3)

There is a minimum point at (0, –3) and a maximum point at (4, 7).

(a) Find the value of

(i) $p = -5$

(ii) $q = \pi/4$

(iii) $r = 2$

(6)

$y = -3$

(b) The equation $y = k$ has exactly **two** solutions. Write down the value of k.

(1)

non-calc

4.) Let $f(x) = \frac{3x}{2} + 1$, $g(x) = 4\cos\left(\frac{x}{3}\right) - 1$. Let $h(x) = (g \circ f)(x)$.

(a) Find an expression for $h(x)$. **(3)**

$4\cos\left(\frac{\frac{3x}{2}+1}{3}\right) - 1$

(b) Write down the period of h. **(1)**

4π

$4\cos\left(\frac{3x/2}{3} + \frac{1}{3}\right) - 1$

(c) Write down the range of h. **(2)**

(Total 6 marks)

$[-5, 3]$

$-5 \leq y \leq 3$

$\frac{3x}{3 \cdot 2}$

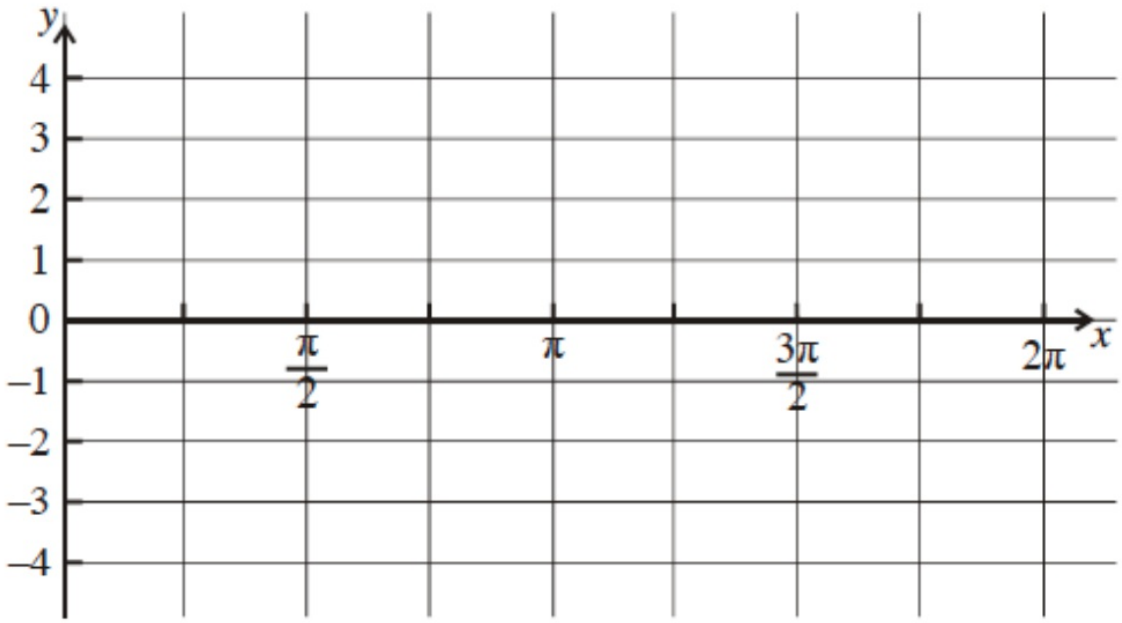
$\frac{3x}{6}$

$\frac{x}{2}$

7.) Consider $g(x) = 3 \sin 2x$.

(a) Write down the period of g.

(b) On the diagram below, sketch the curve of g, for $0 \leq x \leq 2\pi$.



(3)

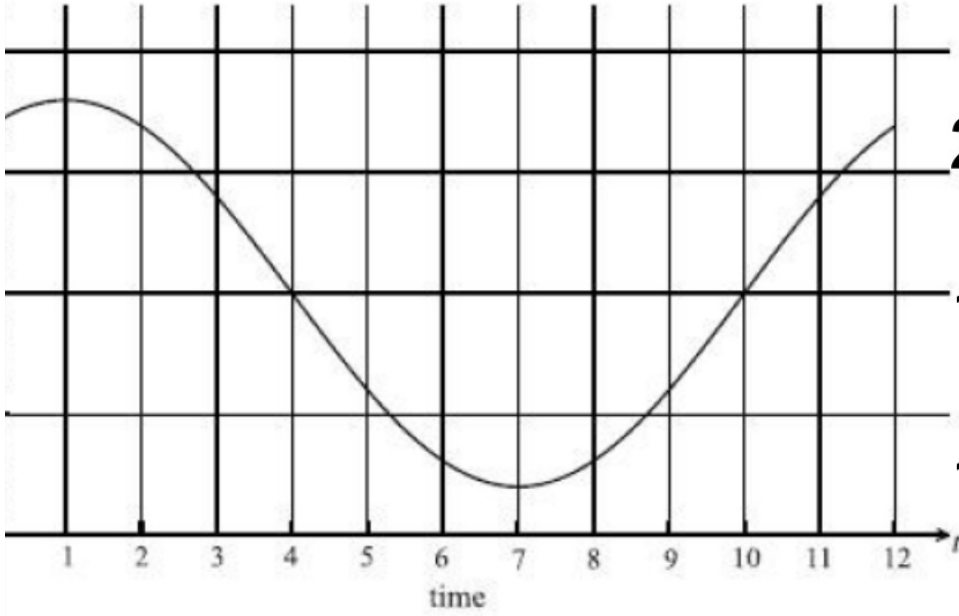
(c) Write down the number of solutions to the equation $g(x) = 2$, for $0 \leq x \leq 2\pi$.

(2)

(Total 6 marks)

9.) The following graph shows the depth of water, y metres, at a point P, during one day.

The time t is given in hours, from midnight to noon.



$12 = 8 (\cos (\pi/6(x - 1)) + 10$

$2 = 8 (\cos (\pi/6(x - 1))$

$1/4 = \cos (\pi/6(x - 1))$

$1/4 = \cos (x\pi/6 - \pi/6)$

$0 = \cos (x\pi/6 - \pi/6) - 1/4$

Use the graph to write down an estimate of the value of t when

i) the depth of water is minimum;

ii) the depth of water is maximum;

iii) the depth of the water is increasing most rapidly.

(b) The depth of water can be modelled by the function $y = A \cos (B (t - 1)) + C$

calculator

(i) Show that $A = 8$.

(ii) Write down the value of C.

(iii) Find the value of B.

(c) A sailor knows that he cannot sail past P when the depth of the water is less t
Calculate the values of t between which he cannot sail past P.

5.) Let $f(x) = 3\sin x + 4\cos x$, for $-2\pi \leq x \leq 2\pi$.

(a) Sketch the graph of f.

(b) Write down

(i) the amplitude;

(ii) the period;

(iii) the x-intercept that lies between $-\frac{\pi}{2}$ and 0.

(3)

(c) Hence write $f(x)$ in the form $p\sin(qx + r)$.

(3)

(d) Write down one value of x such that $f'(x) = 0$.

(2)

(e) Write down the two values of k for which the equation $f(x) = k$ has exactly two solutions.

(2)

(f) Let $g(x) = \ln(x + 1)$, for $0 \leq x \leq \pi$. There is a value of x, between 0 and 1, for which the gradient of f is equal to the gradient of g. Find this value of x.

(5)

(Total 18 marks)