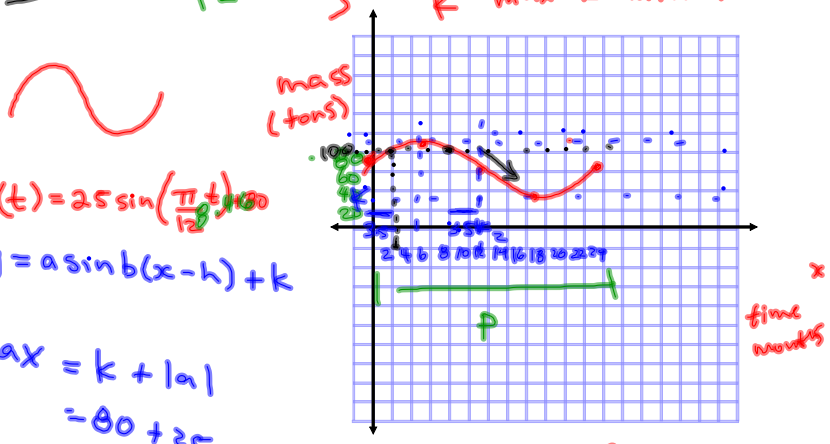
Q15:

$12 - 3.54 = 8.46$ (y) (k) max k min k



$m(t) = 25\sin\left(\frac{\pi}{12}t\right) + 80$

$y = a\sin b(x-h) + k$

$\text{max} = k + |a|$
$= 80 + 25$
$= 105$

$\text{min} = k - |a|$
$= 55$

Start point (h,k)
$(0, 80)$

a)

b)

(12, ~~80~~)

(13, ~~75~~)

if $y_{12} < y_{13}$ increasing

if ~~80~~ > ~~75~~ decreasing

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

$P = \frac{2\pi}{\frac{\pi}{12}}$

$P = 2\pi \times \frac{12}{\pi}$

$P = 24$

c) $m(t) = 100$ $t = ?$

$100 = 25\sin\left(\frac{\pi}{12}t\right) + 80$

$\frac{20}{25} = \frac{25\sin\left(\frac{\pi}{12}t\right)}{25}$

$\sin^{-1}\left(\frac{4}{5}\right) = \sin\left(\frac{\pi}{12}t\right)$

$\frac{\sin^{-1}\left(\frac{4}{5}\right)}{\pi/12} = \frac{\frac{\pi}{12}t}{\frac{\pi}{12}}$

$t = 3.54$ months

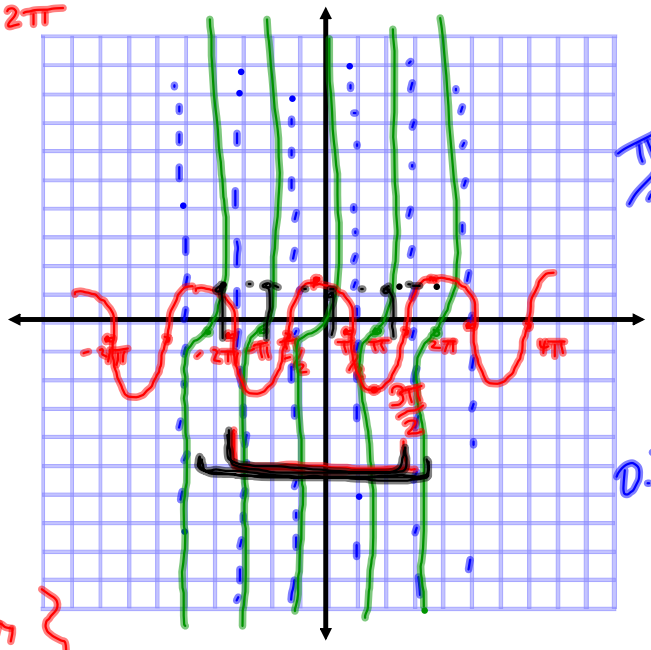
Q4

max & min & max

$f(x) = \cos x$ → period 2π

$g(x) = \tan x$ → period π, asymptotes at the half πs

$g(x) = 1$



a) cos's mins $\{\pi, 3\pi, -\pi, -3\pi\}$

b) $\left]-\frac{3\pi}{2}, -\frac{\pi}{2}\right[\cup \left]-\frac{\pi}{2}, \frac{\pi}{2}\right[\cup \left]\frac{\pi}{2}, \frac{3\pi}{2}\right[$

c) $g(x) = 1$

$\tan^{-1}$ $\tan x = 1$ $\tan^{-1}$

$x = 0.785$

$x_1 = 0.785 + \pi$ ← the period

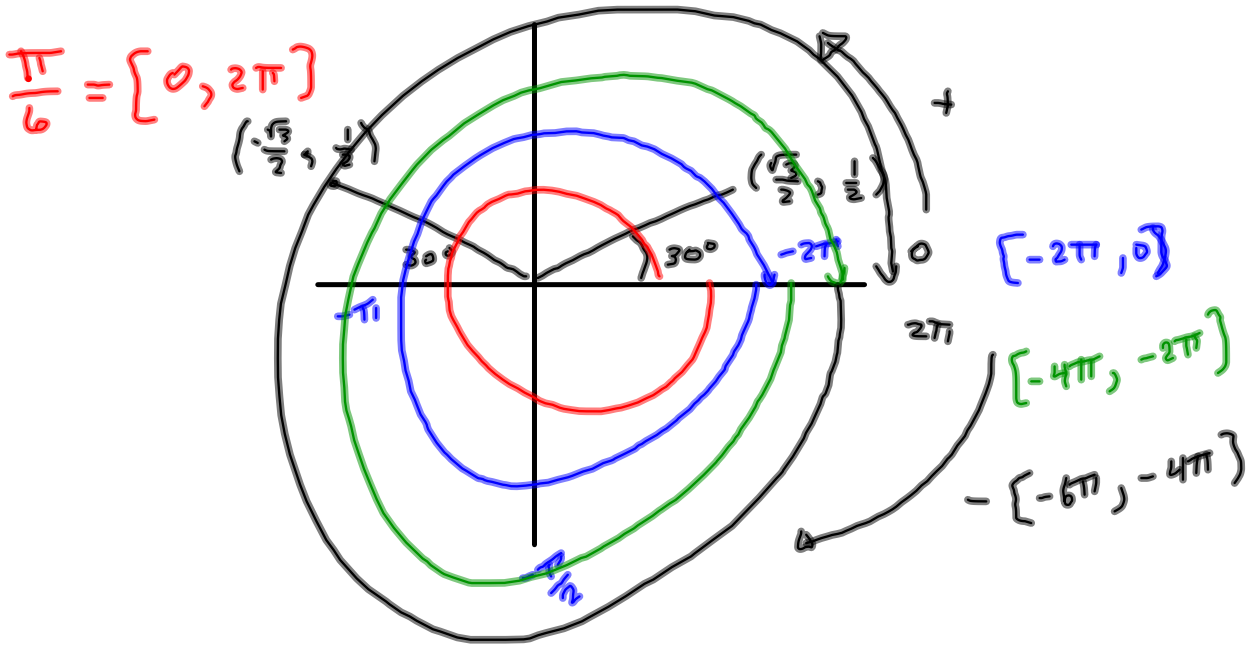
$x_1 = 3.926$ $\quad x_1 \in [-2\pi, 2\pi[$ $\quad -6.283, 6.283$

~~$x_{11} = 3.926 + \pi$~~

~~$x_{11} = 7.067$~~ not in the interval

Solve

$\sin x = \frac{1}{2}$ $\quad x \in [-6\pi, -4\pi]$



Q 9

$$2\sin^2 x + (-2+\sqrt{2})\sin x - \sqrt{2} = 0$$

$$2\sin^2 x - 2\sin x + \sqrt{2}\sin x - \sqrt{2} = 0$$

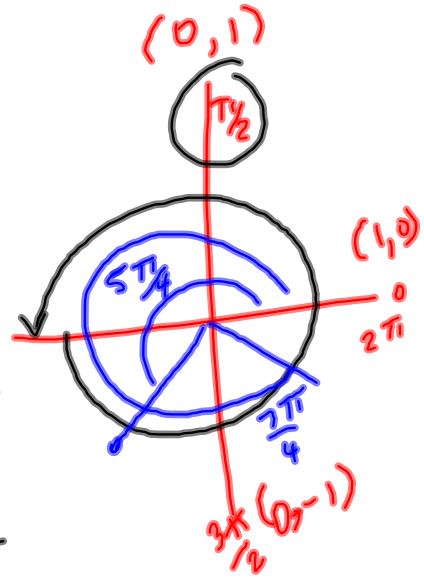
$$2\sin x(\sin x - 1) + \sqrt{2}(\sin x - 1) = 0$$

$$(\sin x - 1)(2\sin x + \sqrt{2}) = 0$$

$$\sin x - 1 = 0 \qquad 2\sin x + \sqrt{2} = 0$$

$$\sin x = 1 \qquad \frac{2\sin x}{2} = -\frac{\sqrt{2}}{2}$$

$$\sin x = -\frac{\sqrt{2}}{2}$$



$$x = \frac{\pi}{2} + \frac{2\pi \times 2}{1 \times 2}$$

$$x = \frac{5\pi}{2}$$

$$x_1 = \frac{5\pi}{4}$$

$$x_{11} = \frac{7\pi}{4}$$