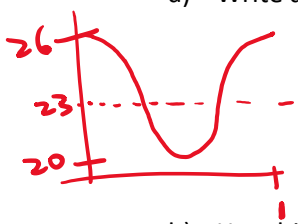
Trig 1 Review B

1. The pendulum of a grandfather clock swings back and forth with a periodic motion that can be represented by a trig function. At rest, the pendulum is 20cm above the base. The highest point of the swing is 26cm above the base, and it takes 2 seconds for a complete swing back and forth.

   a) Write a cosine function if the pendulum is released from the highest point.



Amp = 3, P.S = 0, V.D = 23 $\quad y = 3\cos(2\pi x) + 23$

Period = 1 $\Rightarrow \frac{2\pi}{b} = 1 \quad \therefore b = 2\pi$.

   b) How high above the base is the pendulum 0.3 seconds after it starts to swing?

$y = 3\cos[2\pi(0.3)] + 23 \quad = 22.1\text{ cm}$

   c) After how many seconds will the pendulum be exactly at the height of 21cm above base?

$21 = 3\cos(2\pi x) + 23$

$\frac{-2}{3} = \cos 2\pi x$

$2\pi x = \cos^{-1}\left(\frac{2}{3}\right)$

$x = \frac{0.84}{2\pi}$

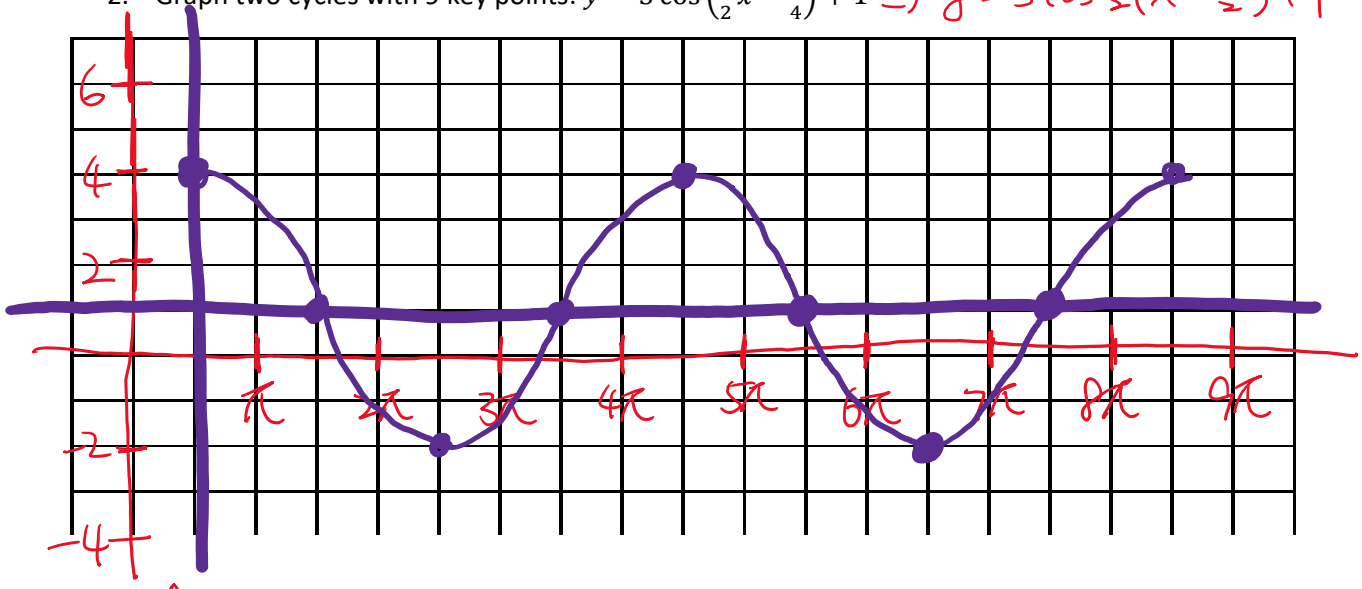
$= 0.13\text{s}$

Reference time

$0.5 - 0.13 = 0.37\text{s}$

$0.5 + 0.13 = 0.63\text{s}$

2. Graph two cycles with 9 key points: $y = 3\cos\left(\frac{1}{2}x - \frac{\pi}{4}\right) + 1 \Rightarrow y = 3\cos\frac{1}{2}\left(x - \frac{\pi}{2}\right) + 1$



Amp = 3 $\quad$ P.S = $\frac{\pi}{2}$

Period = $\frac{2\pi}{\frac{1}{2}} = 4\pi$. $\quad$ V.D = 1

3. Solve the equation $2cos^2x + \cos x - 1 = 0$ for $-\pi \le x \le \pi$

$(2\cos x - 1)(\cos x + 1) = 0$

$\cos x = \frac{1}{2}$ $\quad$ $\cos x = -1$

$x_1 = \pi$

$x_2 = \pi - 2\pi = -\pi$

$\cos x = \frac{1}{2}$

$x_R = \frac{\pi}{3}$

$x_3 = \frac{\pi}{3}$

$x_4 = 2\pi - \frac{\pi}{3}$

$= \frac{5\pi}{3}$ ×

$\frac{5\pi}{3} - 2\pi$

$= \frac{-\pi}{3}$

$= \frac{-\pi}{3}$

4. If $\cot\theta = -\frac{3}{4}$ and $\csc\theta < 0$, then what is the value of $\sin\theta$?

$\cot\theta < 0$ & $\csc\theta < 0$

$\therefore \theta$ in Q4

$r = \sqrt{3^2+4^2}$

$= 5$

$\sin\theta = \frac{-4}{5}$

5. What is the radius of a circle if an arc length of 3m subtends an angle of 30° on the circle?

$30^\circ = \frac{\pi}{6}$

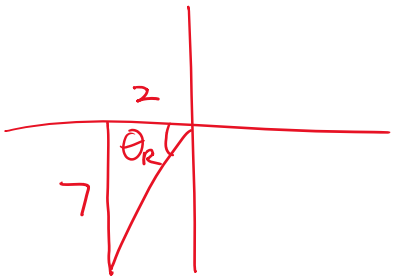
$a = r\theta$

$3 = r\left(\frac{\pi}{6}\right)$

$r = 3 \cdot \frac{6}{\pi}$

$= \frac{18}{\pi}$ m

6. The point (-2, -7) is on the terminal arm of angle θ. What is the value of θ?



$\theta_R = \tan^{-1}\left(\frac{7}{2}\right)$

$= 1.29$

$\theta = \pi + 1.29$

$= 4.43$ rad