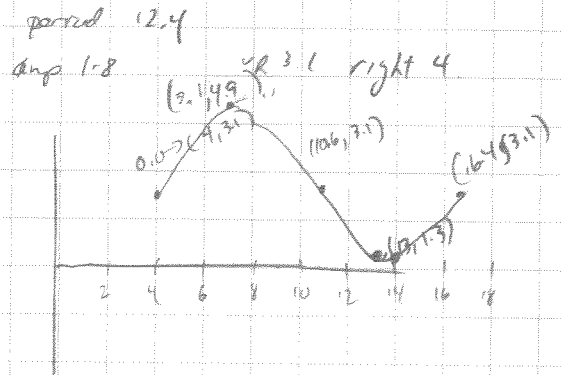
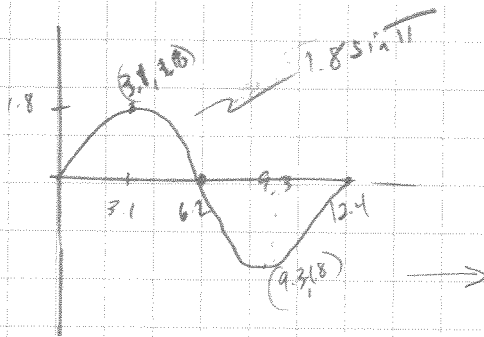


Applications Homework:

① $h = 1.8 \sin 2\pi \left(\frac{t-4.00}{12.4} \right) + 3.1$



a) 5 am: $h = 1.8 \sin 2\pi \left(\frac{5-4}{12.4} \right) + 3.1$

$h = 3.97354 \rightarrow h = 4.0m$

noon $\rightarrow h = 1.8 \sin 2\pi \left(\frac{12-4}{12.4} \right) + 3.1$

$= 1.6766 \quad h = 1.7$

b) max depth 4.9 when $t = 7.1 \rightarrow 7am 6min$

②

$t = 1.89 \sin 2\pi \left(\frac{n-80}{365} \right) + 6.41$

a) $t = 1.89 \sin 2\pi \left(\frac{293-80}{365} \right) + 6.41$

$= 5.46 \rightarrow 5 \text{ hours } 28 \text{ minutes}$

b) 6:15 am $\rightarrow \frac{t-6.41}{1.89} = \sin 2\pi \left(\frac{n-80}{365} \right) + 6.5$

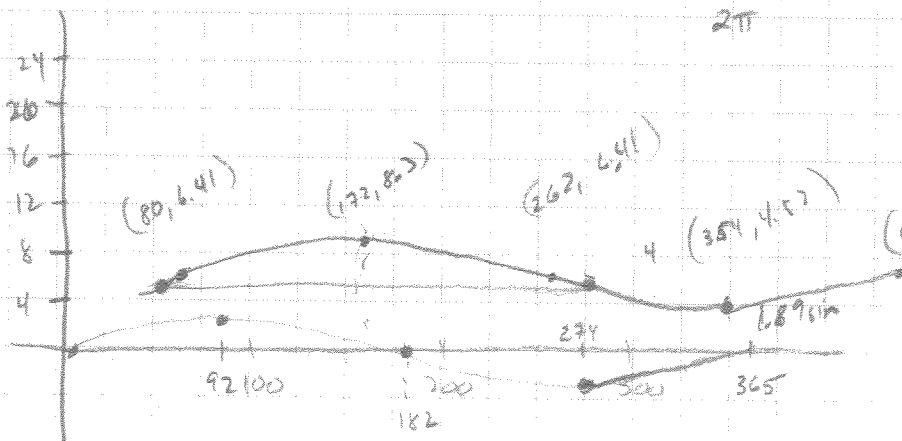
\downarrow
6.25 hours $\sin^{-1} \left(\frac{t-6.41}{1.89} \right) = \frac{(n-80)(2\pi)}{365}$

$\frac{365}{2\pi} \sin^{-1} \left(\frac{t-6.41}{1.89} \right) + 80 = n$

$\frac{365}{2\pi} \sin^{-1} \left(\frac{6.25-6.41}{1.89} \right) + 80 = n$

$(75 = n)$

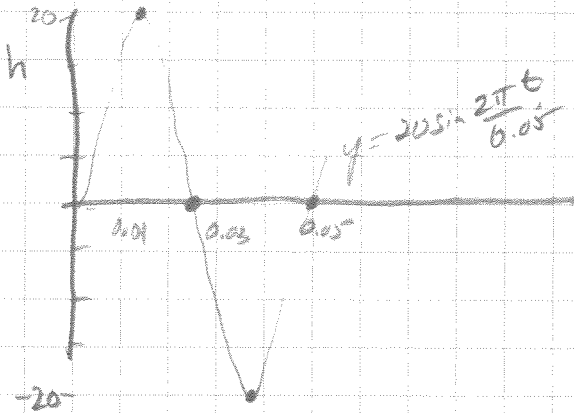
March 16



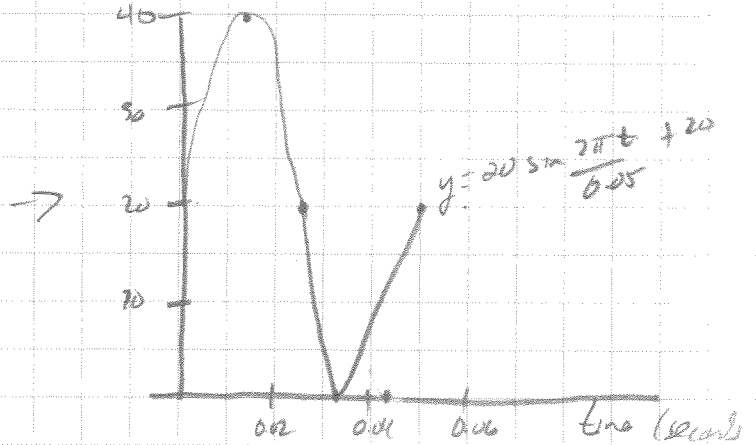
75 93 172 + 93 265 \rightarrow Sept 22

Aprs H.W #2

④ $h = 20 \sin \left(\frac{2\pi t}{0.05} \right) + 20$



period = 0.05 cm



max height = 40 cm
min height = 0 cm.

one cycle = 0.05 s → 2 cycles = 0.1 s
20 cycles → 1.0 s
120 cycles → 6 s
1200 cycles → 1 min
72000 cycles → 60 min

Apps H.W Pg (3)

#6 $d(t) = 2.5 \sin 0.164\pi (t - 1.5) + 13.4$

$0.164\pi \rightarrow 2\pi (0.024)$
 $\rightarrow = \frac{2\pi}{12} \rightarrow$

a) $d(10) = 2.5 \sin 0.164\pi (10 - 1.5) + 13.4$
 $= 11.04$ metres

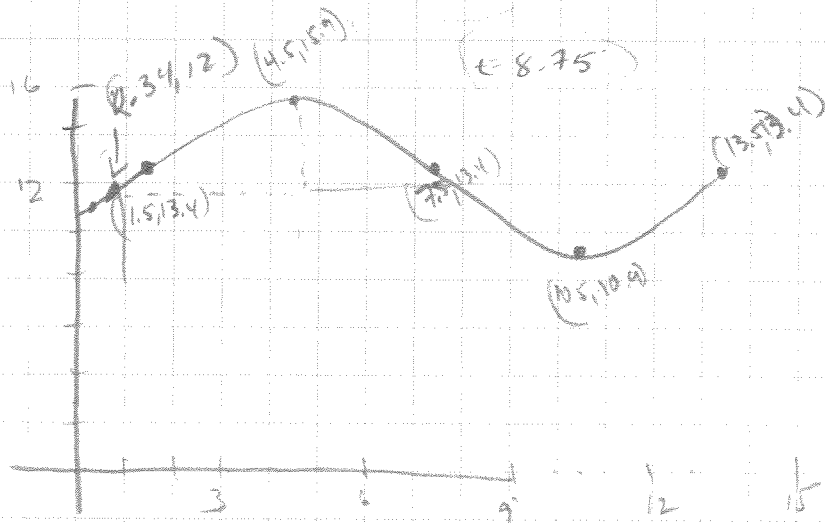
b) $\frac{d - 13.4}{2.5} = \sin 0.164\pi (t - 1.5)$

$\sin^{-1} \left(\frac{d - 13.4}{2.5} \right) = 0.164\pi (t - 1.5)$

$\frac{1}{0.164\pi} \sin^{-1} \left(\frac{d - 13.4}{2.5} \right) + 1.5 = t$

$\frac{1}{0.164\pi} \sin^{-1} \left(\frac{12 - 13.4}{2.5} \right) + 1.5 = t$

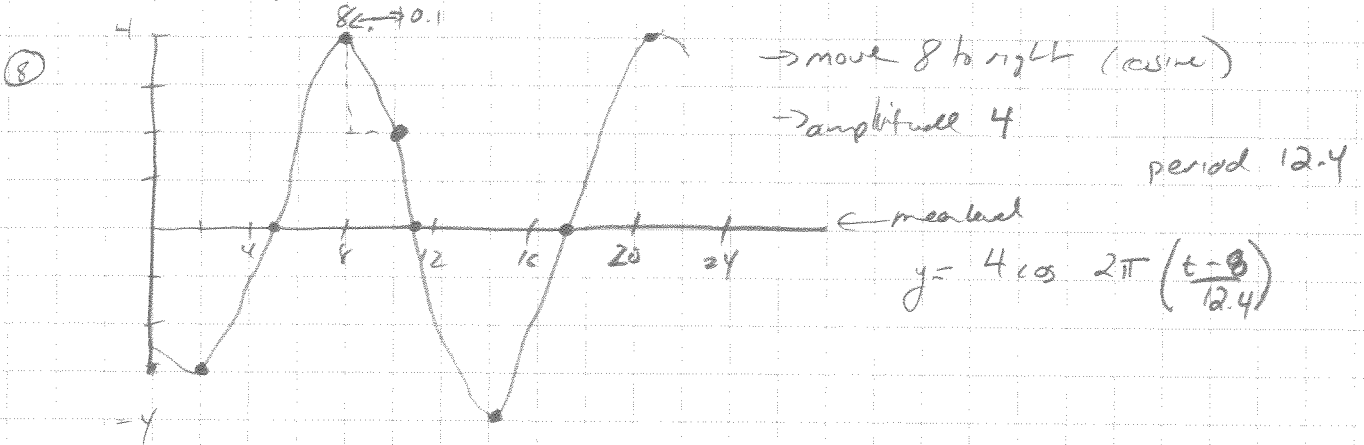
$0.34 = t \quad \times 60 \approx 20$ minutes



0.34 4.16 4.5 4.16 8.66

8.32 hours

Application H.W.



b) $y = 4 \cos 2\pi \left(\frac{10.1-t}{12.4} \right)$

$y = 2.12 \text{ m}$

c) $\frac{y}{4} = \cos 2\pi \left(\frac{t-8}{12.4} \right)$

$\cos^{-1} \left(\frac{y}{4} \right) = 2\pi \left(\frac{t-8}{12.4} \right)$

$\frac{12.4}{2\pi} \cos^{-1} \left(\frac{y}{4} \right) + 8 = t$

$\frac{12.4}{2\pi} \cos^{-1} \left(\frac{2}{4} \right) + 8 = t$

$10.1 = t$

10 hours 6 min.

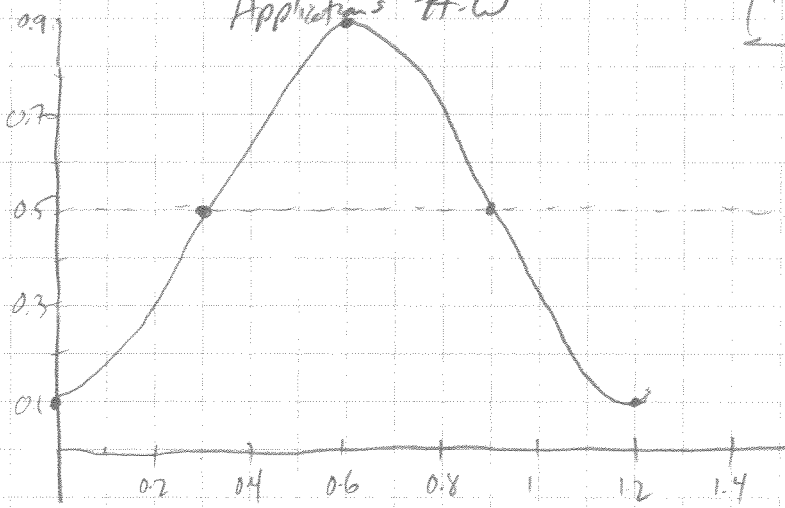
$10.1 - 8 = 2.1$

$8 - 2.1 = 5.9$

5 hours 54 min

Applications #10

#10, 12a



Amp $\rightarrow 0.4$

Period = 1.2 $\rightarrow k = \frac{2\pi}{1.2}$

cosine \rightarrow right 0.6

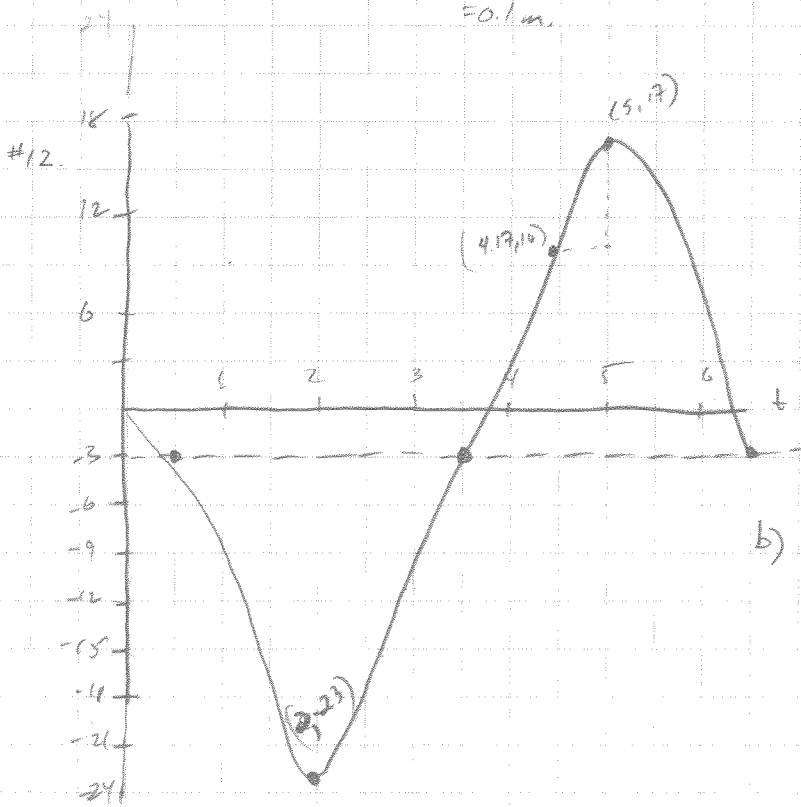
up 0.5

a) $y = 0.4 \cos \frac{2\pi}{1.2} (t - 0.6) + 0.5$

b) i) $h(0.3) = 0.4 \cos \frac{2\pi}{1.2} (0.3 - 0.6) + 0.5$
 $= 0.5 \text{ m}$

ii) $h(0.7) = 0.4 \cos \frac{2\pi}{1.2} (0.7 - 0.6) + 0.5$
 $= 0.85 \text{ m}$

iii) $h(1.2) = 0.4 \cos \frac{2\pi}{1.2} (1.2 - 0.6) + 0.5$
 $= 0.1 \text{ m}$



a) Amplitude 20

Period is 6

cosine flipped & shifted right 2 down 3

$y = -20 \cos 2\pi \left(\frac{t-2}{6} \right) - 3$

b) $\frac{y+3}{-20} = \cos 2\pi \left(\frac{t-2}{6} \right)$

$\cos^{-1} \left(\frac{y+3}{-20} \right) = 2\pi \left(\frac{t-2}{6} \right)$

$\frac{6}{2\pi} \cos^{-1} \left(\frac{y+3}{-20} \right) + 2 = t$

Applications H.W

#12 b9c

12 b) $y = -20 \cos 2\pi \left(\frac{t-2}{6} \right) - 3$

i) $t = 2.8$: $y = -20 \cos 2\pi \left(\frac{2.8-2}{6} \right) - 3$
 $= -16.4$

$t = 6.3$ $y = -20 \cos 2\pi \left(\frac{6.3-2}{6} \right) - 3$
 $= 1.16$

$t = 15$ $y = -20 \cos 2\pi \left(\frac{15-2}{6} \right) - 3$
 $= -13$

12 c) $y = ?$ when $t = 0$ $y = -20 \cos 2\pi \left(\frac{-2}{6} \right) - 3$
 $= +10 - 3$
 $= 7$

12 d) 10m from bank? $y = 10$

$\frac{6}{2\pi} \cos^{-1} \left(\frac{10+3}{-20} \right) + 2 = t$

$4.17 = t$

$5 - 4.17 = 0.824$

$\Rightarrow 5 + 0.824 = 5.82$

$4.17 + 6 = 10.17$

$+6 = 16.17$

$5.82 + 6 = 11.82$

$+6 = 22.17$

$+6 = 17.82$

$+6 = 28.17$

$+6 = 23.82$

$+6 = 34.17$

$+6 = 29.82$

$+6 = 40.17$

$+6 = 35.82$

$+6 = 46.17$

$+6 = 41.82$

$+6 = 52.17$

$+6 = 47.82$

$+6 = 58.17$

$+6 = 53.82$

$+6 = 59.82$

Applications H.W.

7)

- a) Amp. = 2.5
 Period = 365
 Right = 172
 Up 17.2

$$\omega = k = \frac{2\pi}{365}$$

$$y = 2.5 \cos \frac{2\pi (t-172)}{365} + 17.2$$

- b) i) May 10 \rightarrow Day 130

$$y = 2.5 \cos \frac{2\pi (-42)}{365} + 17.2$$

$$= 1.874566003 + 17.2$$

$$= 19.07$$

$$\rightarrow .07 \text{ hour} = 34 \text{ min}$$

\approx 7 pm 34 minutes.

- ii) Jun 12 \rightarrow Day 163

$$y = 2.5 \cos \frac{2\pi (-9)}{365} + 17.2$$

$$= 20.17 \text{ h.}$$

\approx 8 pm 10 min.

- iii) Sept 17 Day 260

$$y = 2.5 \cos \frac{2\pi (88)}{365} + 17.2$$

$$= 17.839$$

\approx 5 pm 50 min

- iv) Dec 2 Day 336

$$y = 2.5 \cos \frac{2\pi (164)}{365}$$

$$y = 15.326$$

\approx 3 pm 20 min.

c) Rearrange:

$$\frac{y-17.2}{2.5} = \cos \frac{2\pi (t-172)}{365}$$

$$\cos^{-1} \left(\frac{y-17.2}{2.5} \right) = \frac{2\pi (t-172)}{365}$$

$$\frac{365}{2\pi} \cos^{-1} \left(\frac{y-17.2}{2.5} \right) + 172 = t$$

Applications #7 (cont'd)

$$c) \frac{365}{2\pi} \cos^{-1} \left(\frac{19-17.7}{2.5} \right) + 172 = n$$

$$59.48257 + 172 = n$$

$$231.5 = n$$

so 232 \rightarrow Day 232 = Aug 20

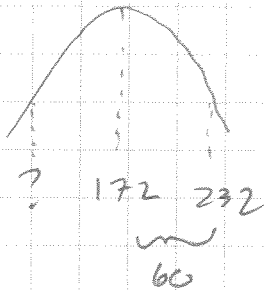
would also happen

60

days earlier than day 172

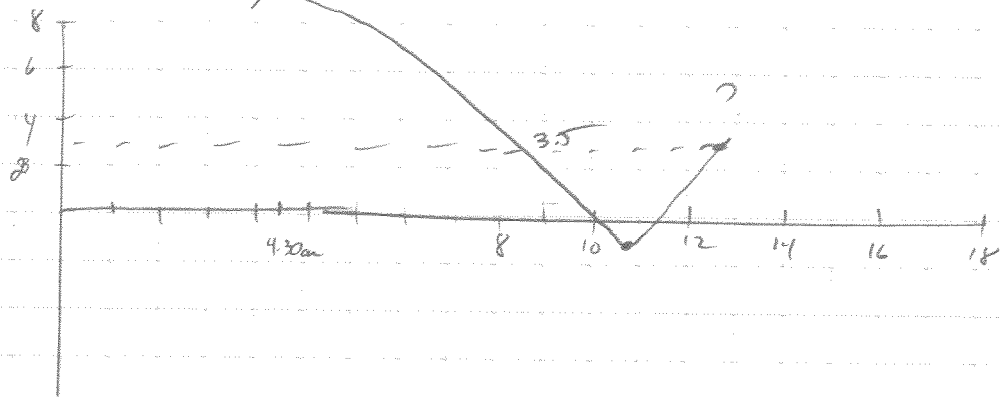
which is day 112

day 112 = April 22nd



Applications H.W #9

#9



$$(4.5, 9.6)$$

$$(10.7, 0.4)$$

a) Amplitude = $\frac{9.6 - 0.4}{2} = 4.6$
 Period = $(10.7 - 4.5) \times 2 = 12.4$
 V.T. = $9.6 - 4.6 = 5$ up
 Pos. = Right 4.5

$$y = 4.6 \cos \frac{2\pi(t - 4.5)}{12.4} + 5$$

b) i) 9:30am $y = 4.6 \cos \frac{2\pi(9.5 - 4.5)}{12.4} + 5$
 $= 1.22 \text{ m}$

ii) 6:45pm $\rightarrow 18.75$
 $y = 4.6 \cos \frac{2\pi(18.75 - 4.5)}{12.4} + 5$
 $= 7.72 \text{ m}$

c) Rearrange:

$$\frac{y-5}{4.6} = \cos \frac{2\pi(t-4.5)}{12.4}$$

$$\cos^{-1}\left(\frac{y-5}{4.6}\right) = \frac{2\pi(t-4.5)}{12.4}$$

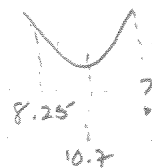
$$\frac{12.4}{2\pi} \cos^{-1}\left(\frac{y-5}{4.6}\right) + 4.5 = t$$

i) 3.5m:

$$\frac{12.4}{2\pi} \cos^{-1}\left(\frac{3.5-5}{4.6}\right) + 4.5 = t$$

$$8.2555 = t$$

at 8 am 15 min



$$10.7 - 8.25 = 2.45$$

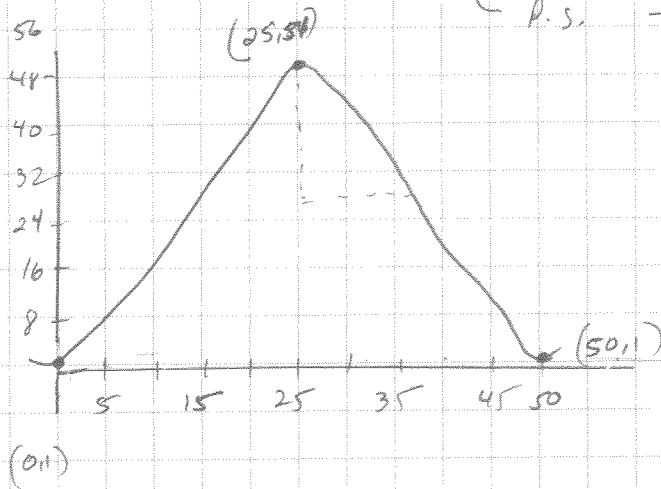
again at
 $10.7 + 2.45 =$
 13.15 min
 $= 1 \text{ pm } 15 \text{ min}$

Applications H.W #11.

a)

$$y = 25 \cos \frac{2\pi(t-25)}{50} + 26$$

$$\left\{ \begin{array}{l} \text{Amp} = 25 \\ \text{Period} = 50 \rightarrow k = \frac{2\pi}{50} \\ \text{V.t} \rightarrow \text{sup } 26 \\ \text{P.S.} \rightarrow R \ 25 \end{array} \right.$$



b)

i) 10s $\rightarrow y = 25 \cos \frac{2\pi(t-15)}{50} + 26$

= 18m

ii) 20s $\rightarrow y = 25 \cos \frac{2\pi(t-5)}{50} + 26 = 46m$

iii) 40s $\rightarrow y = 25 \cos \frac{2\pi(t-25)}{50} + 26 = 18m$

iv) 60s $\rightarrow y = 25 \cos \frac{2\pi(t-45)}{50} + 26 = 18m$

c) Rearrange:

$$\frac{y-26}{25} = \cos \frac{2\pi(t-25)}{50}$$

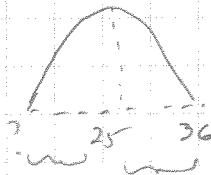
$$\cos^{-1} \left(\frac{y-26}{25} \right) = \frac{2\pi(t-25)}{50}$$

$$\frac{50}{2\pi} \cos^{-1} \left(\frac{y-26}{25} \right) + 25 = t$$

$$\frac{50}{2\pi} \cos^{-1} \left(\frac{30-26}{25} \right) + 25 = t$$

$$36 = t$$

and



$$25 - 11 = 0.14s$$

then at periods of "50"

$$14 + 50 = 1:04$$

$$+ 50 = 1:54 + 50 = 2:44$$

$$+ 50 = 3:34$$

$$+ 50 = 4:24$$

$$36 + 50 = 1:26$$

$$+ 50 = 2:16$$

$$+ 50 = 3:06$$

$$+ 50 = 3:56 + 50 = 4:46$$