

# App of trig functions

$$y = 2 \sin\left(\frac{2\pi}{3}(x-1)\right) + 3$$

Period = 3

amplitude = 2  
 phase shift = 1

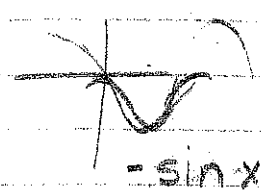
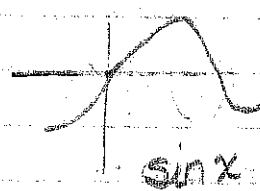
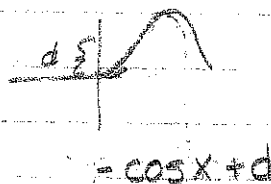
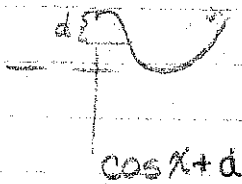
$$y = 5 \cos\left(\frac{2\pi}{5}(x-4)\right) + 1$$

Period = 5

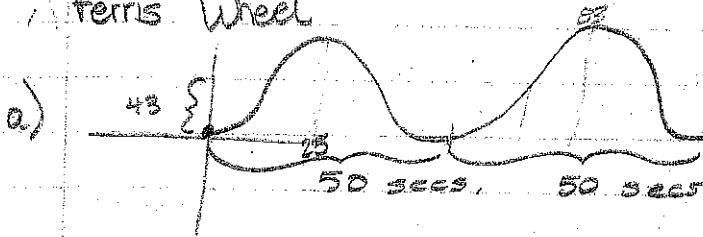
amplitude = 5  
 phase shift = 4

a) (amp)  $a = 3$   
 period  $b = 2$   
 phase shift  $c = -4$   
 vert dis  $d = 6$   
 $y = 3 \cos\left(\frac{\pi}{2}(x+4)\right) + 6$

b) max = 25 }  $\Delta = 12$   $a = 6$   
 min = 13 }  $\pm 2$   $d = 19$   
 period  $b = 6$   
 phase shift = 3  
 $y = 6 \cos\left(\frac{\pi}{3}(x-3)\right) + 19$



## Ferris Wheel



$a = 42$   
 $b =$   
 $c =$   
 $d = 43$

$\frac{2\pi}{50} = \frac{\pi}{25}$   
 $\left(\frac{50}{2}\right) = 25$

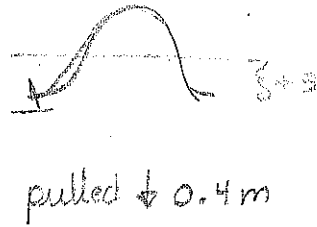
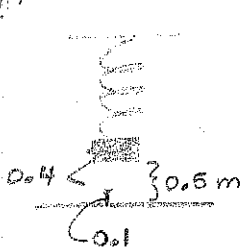
b)  $h(t) = -42 \cos\left(\frac{\pi}{25}t\right) + 43$

c)  $h(t) = -42 \cos\left(\frac{\pi}{25} \cdot 60\right) + 43 = 56.0$  (55.9787)

d)  $25 = -42 \cos\left(\frac{\pi}{25}t\right) + 43$

$-18 = -42$   
 $\frac{9}{21} = \frac{3}{7} = \cos\left(\frac{\pi}{25}t\right) = 1.12$   
 $\frac{\pi}{25}t = 1.13$   
 $t = 8.975$   
 $t = 1.13 \cdot 25$

Mass Spring



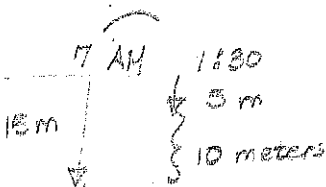
$T = 1.2$  s period

$$h(t) = -0.4 \cos\left(\frac{2\pi}{1.2}t\right) + 0.5$$

$$h(t) = -0.4 \cos\left(\frac{5\pi}{3}t\right) + 0.5$$

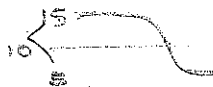
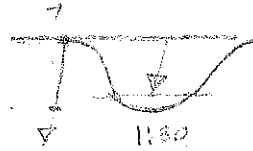
$$\frac{20\pi}{12} = \frac{10\pi}{6} = \frac{5}{3}\pi$$

Scaport

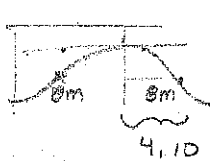


$$\frac{18.0}{-7} = \frac{6.5}{y}$$

$$y = 13$$



- a)  $h(t) = 5 \cos\left(\frac{2\pi}{13}t\right) + 10$
- b)  $h(t) = 5 \cos\left(\frac{2\pi}{13} \cdot 4\right) + 10 = 8.2$  meters
- c)  $8 = 5 \cos\left(\frac{2\pi}{13}t\right) + 10$



$$-2 = 5 \cos(\quad)$$

$$\frac{-2}{5} = \cos(\quad)$$

$$1.98 = \frac{2\pi}{13}(t-7)$$

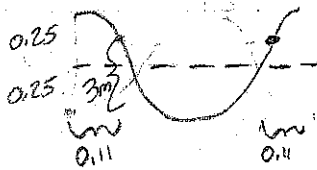
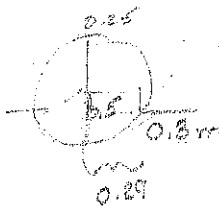
$$t = \frac{1.98 \cdot 13}{2\pi} + 7 = 11.10$$

time =  $2(4.10) = 8.20$  hrs

from center  
dist = 4.1

$$\frac{7}{15} = \frac{179}{300} = 0.249 \text{ secs}$$

Art



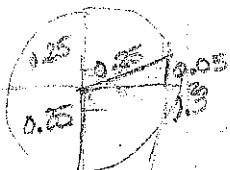
$$h(t) = 0.25 \cos\left(\frac{2\pi}{0.11}t\right) + 0.5$$

$$0.3 = -0.25 \cos\left(\frac{4\pi}{11}t\right) + 0.25$$

$$+0.05 = -0.25 \cos 4\pi t$$

$$-0.2 = \cos 4\pi t$$

$$t = \frac{\cos^{-1}(-0.2)}{4\pi} = 0.11 \text{ s}$$



$t_{\text{total}} = 0.5$   
 $-0.11$   
 $-0.11$   
 $0.28 \text{ sec}$

Tide

1)  $h(t) = 4.5 \sin(0.5t - 1.5) + 7.3 = 4.5 \sin(0.5(t-3)) + 7.3$

a) 11.8 m  $\begin{cases} 7.3 + 4.5 = 11.8 \\ 7.3 - 4.5 = 2.8 \end{cases}$

b) 2.8 m

c) 7.3 m  $\begin{cases} 3 + 2.8 \\ \frac{2}{2} \end{cases}$

d)  $\frac{2\pi}{p} = 0.5 \Rightarrow \frac{2\pi}{p} = \frac{0.5}{1} \Rightarrow 0.5p = 2\pi \Rightarrow p = \frac{2\pi}{0.5} = 4\pi$

e)  $h(8) = 4.5 \sin(0.5(8) - 1.5) + 7.3 = 9.99 \text{ m}$

$h(16) = 4.5 \sin(0.5(16) - 1.5) + 7.3 = 8.27 \text{ m}$

Seaport

2)  $d(t) = 2.6 \sin 0.25(t-5) + 3.3$

$3.5 = 2.6 \sin 0.25(t-5) + 3.3$

$0.2 = 2.6 \sin 0.25(t-5)$

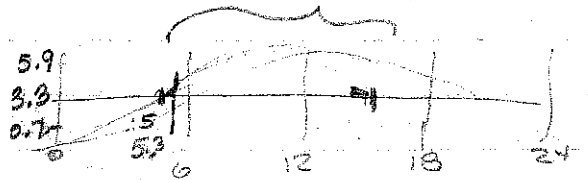
$\frac{0.2}{2.6} = \sin 0.25(t-5)$

$0.0770 = 0.25(t-5)$

$0.308 = t-5$

$t = 5.308$

$\frac{2\pi}{p} = 0.25$   
 $p = \frac{2\pi}{0.25} = 25.132$   
 $\frac{1}{2} \text{ period} = 12.566$



$h(\min) = 0.7 @ (-1.28, 0.7)$

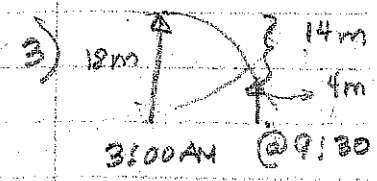
$t_{ev} = 22.72$

$+ 5.3$

$\text{repeat} = 17.42$

$\Delta 5.308 - 5 = 0.308$   
 $\frac{25.132 - 2(0.308)}{2} = 11.95$

total time: 11.95 hrs

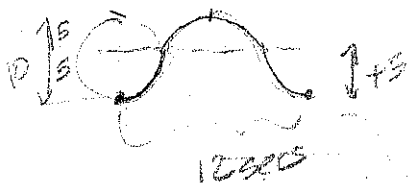


6.5 hrs

x2 = 13 hrs

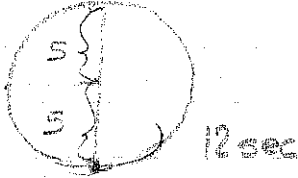
$d(t) = +7 \cos \left( \frac{2\pi}{13} (t-3) \right) + 11$

$\frac{18+4}{2} = 11$

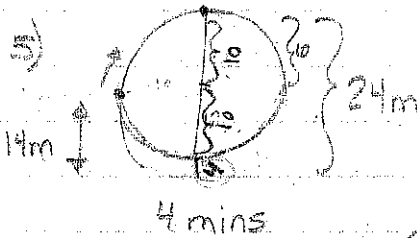


$$B = \frac{2\pi}{12}$$

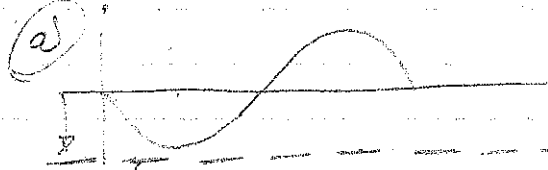
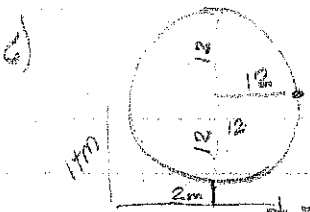
Wheel 10 cm



$$h(t) = -5 \cos\left(\frac{\pi}{6}t\right) + 5$$



$$h(t) = 10 \sin\left(\frac{2\pi}{4}t\right) + 14 \text{ (mins)}$$



$$t = 40 \text{ secs } \{ h(t) = -12 \sin\left(\frac{2\pi}{40}t\right) + 14 \}$$

b)  $\{ h(t) = -12 \sin\left(\frac{\pi}{20}t\right) + 14 \}$

c)  $h(25) = -12 \sin\left(\frac{\pi}{20} \cdot 25\right) + 14$

$h(25) = 22.49 \text{ m}$

d)  $6 \text{ m} = -12 \sin\left(\frac{\pi}{20}t\right) + 14$

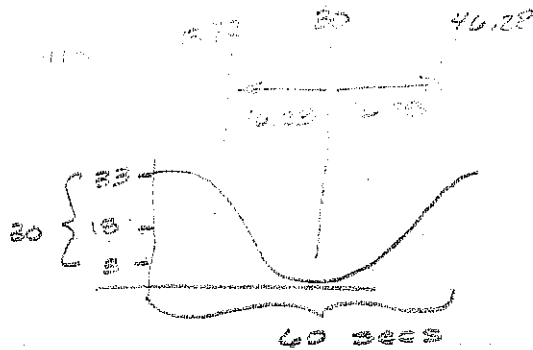
$-8/12 = \sin\left(\frac{\pi}{20}t\right)$

$0.730 = \frac{\pi}{20}t$

$t = 0.730 \cdot 20/\pi = 4.65 \text{ secs}$



- 9)  $d = 30\text{ m}$   
 $\text{ctr} = 18\text{ m}$   
 $\text{time} = 60\text{ sec}$   
 $\text{start @ top}$



a)  $h(t) = 15 \cos\left(\frac{2\pi}{60} t\right) + 18$

$h(t) = 15 \cos\left(\frac{\pi}{30} t\right) + 18$

b)  $h(52) = 15 \cos\left(\frac{\pi}{30} \cdot 52\right) + 18$

$h(52) = 28.04\text{ meters}$

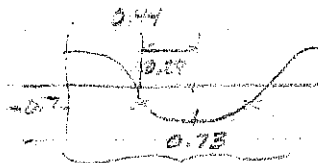
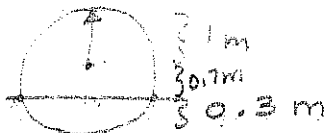
c)  $20 = 15 \cos\left(\frac{\pi}{30} t\right) + 18$

$\frac{2}{15} = \cos\left(\frac{\pi}{30} t\right)$

$t = 1.4 \left(\frac{30}{\pi}\right) = 13.72\text{ secs}$

$t = 44.28\text{ secs}$

- 10)  $r = 1\text{ m}$   
 $\text{time} = 1.46\text{ secs}$



a)  $h(t) = \cos\left(\frac{2\pi}{1.46} t\right)$   
 $= \cos\left(\frac{\pi}{0.73} t\right)$

b)  $-0.7 = \cos\left(\frac{\pi}{0.73} t\right)$

$2.35 = \frac{\pi}{0.73} t$

$t_1 = \frac{2.35 \cdot 0.73}{\pi} = 0.55$

$t_2 = 0.73 + (0.73 - 0.55) = 0.91$

$h(t) = \cos\left(\frac{100\pi}{73} t\right) + 0.7$

$0 = \cos\left(\frac{100\pi}{73} t\right) = 0.7$

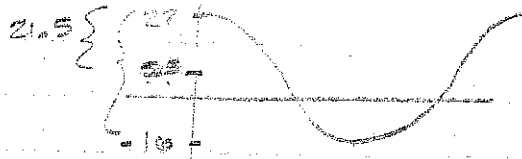
$t = \left(\frac{73}{100\pi}\right) \cos^{-1}(-0.7) = 0.54517$

$\Delta t = 0.34\text{ secs}$

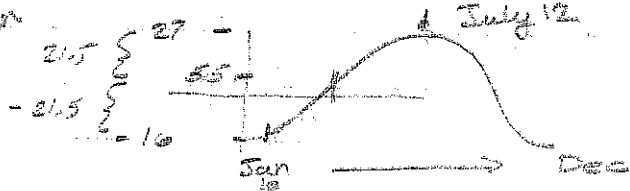
3-31 7-1  
 27  
 19  
 20  
 732  
 34  
 $\frac{27}{360} = \frac{\pi}{183}$   
 days  
 Cycle = 360  $\times \frac{1}{2} = 183$   
 $3-12 = 19 + 31 + 30 + 31 + 30 + 31 + 10 = 182$

11) High = 27°C July 12th  
 Low = -16°C Jan 10th  
 is 43°C 182

$\frac{27 + (-16)}{2} = 5.5$  average (ctr)



formula from low to high because the 4 year starts in Jan



a)  $T(t) = -21.5 \cos\left(\frac{\pi}{183}(t-10)\right) + 5.5$

b) March 15 = Jan + Feb + 15 = 31 + 29 + 15 = 75 days  
 $T(75) = -21.5 \cos\left(\frac{\pi}{183}(75-10)\right) + 5.5$   
 $T(75) = -3.95^\circ\text{C}$   
 Today = 2 - 3.95 = -1.95  
 65 days → -7.1°C

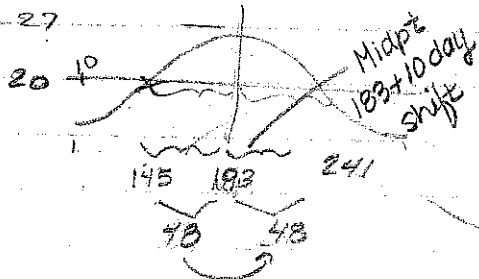
c)  $20 = -21.5 \cos\left(\frac{\pi}{183}(d-10)\right) + 5.5$

$\frac{20-5.5}{-21.5} = \cos(\dots)$

$-0.674 = \cos(\dots)$

$2.311 = \frac{\pi}{183}(t-10)$

$\frac{2.311 \cdot 183}{\pi} + 10 = t \quad t = 145^{\text{th}} \text{ day}$



Period

48  
+48

96 days

- S-31
- F-29
- M-31
- A-30
- M-31
- J-30
- S-12

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- 194
- 10

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- 184

