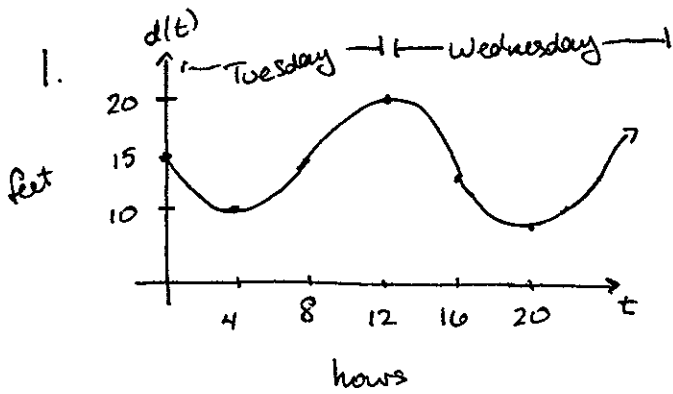


# Sinusoidal Modeling Part 2 - Solutions

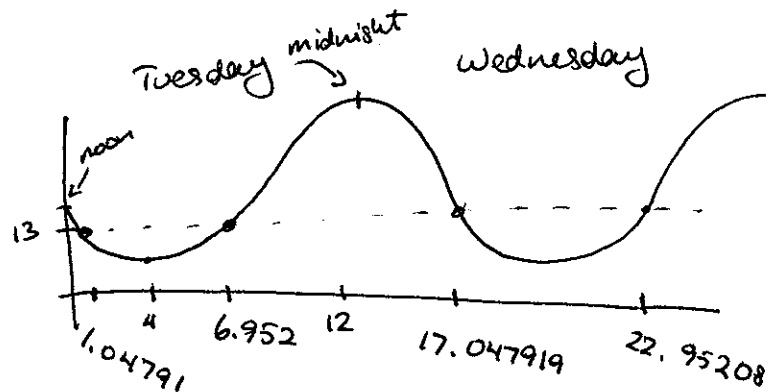


Amp: 5  
 Axis:  $y=15$   
 P.S. right 8 (sine)  
 Period: 16 hrs  $\rightarrow \frac{2\pi}{16} = \frac{\pi}{8}$

a.  $d(t) = 5 \sin \frac{\pi}{8}(t-8) + 15$

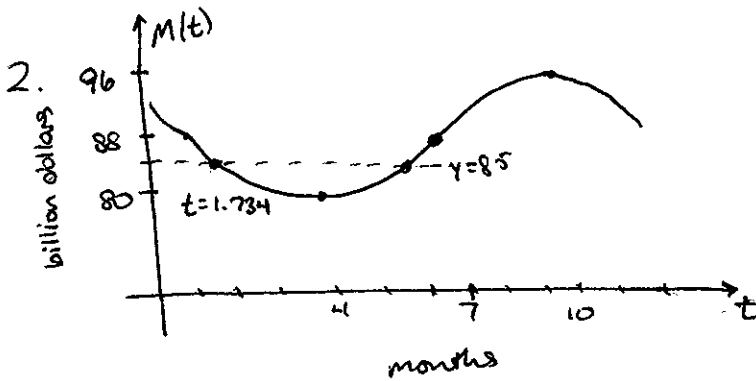
b.  $d(6) = 5 \sin \frac{\pi}{8}(6-8) + 15$   
 $= \boxed{11.4164 \text{ feet}}$

c.  $13 = 5 \sin \frac{\pi}{8}(t-8) + 15$   
 $-2 = 5 \sin \frac{\pi}{8}(t-8)$   
 $-\frac{2}{5} = \sin \frac{\pi}{8}(t-8)$   
 $\frac{\pi}{8}(t-8) = -.4115168$   
 $t = 6.952$



$d(t) < 13$  when  
 $t \in (17.048, 22.952)$

OR  $\boxed{\text{About 5:03 am to 10:57 am on Wednesday}}$



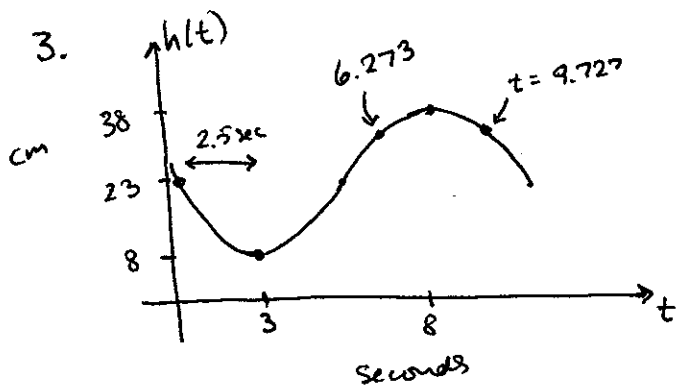
Amp: 8  
 Axis:  $y=88$   
 P.S. right 10  
 Period: 12 months  $\rightarrow \frac{2\pi}{12} = \frac{\pi}{6}$

a.  $M(t) = 8 \cos \left( \frac{\pi}{6}(t-10) \right) + 88$

b.  $M(8) = 8 \cos \left( \frac{\pi}{6}(8-10) \right) + 88$   
 $= \boxed{92 \text{ billion dollars}}$

c.  $85 = 8 \cos \frac{\pi}{6}(t-10) + 88$   
 $-\frac{3}{8} = \cos \frac{\pi}{6}(t-10)$   
 $\frac{\pi}{6}(t-10) = 1.955193$   
 $t = 13.734$   
 $t = 1.734$

OR  $\boxed{\text{During February, March, April, May, and June}}$



Amp: 15

Axis:  $y = 23$

P.S. right 8

Period: 10  $\rightarrow \frac{2\pi}{10} = \frac{\pi}{5}$

a.  $h(t) = 15 \cos \frac{\pi}{5}(t-8) + 23$

b.  $h(15) = 15 \cos \frac{\pi}{5}(15-8) + 23$   
 $= \boxed{18.365 \text{ cm}}$

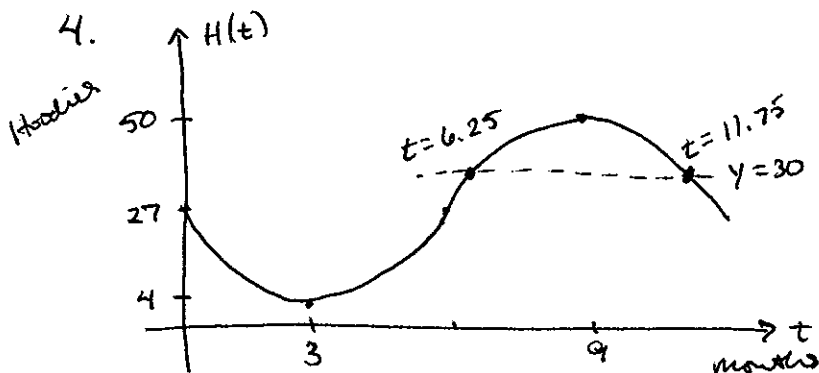
c. 0.5 sec

d.  $30 = 15 \cos \frac{\pi}{5}(t-8) + 23$   
 $\frac{7}{15} = \cos \frac{\pi}{5}(t-8)$

$\frac{\pi}{5}(t-8) = 1.085278$

$t = 9.727$

$t \in (6.273, 9.727) \text{ seconds}$



Amp: 23

Axis:  $y = 27$

P.S. right 6

Period: 12  $\rightarrow \frac{2\pi}{12} = \frac{\pi}{6}$

a.  $H(t) = 23 \sin \frac{\pi}{6}(t-6) + 27$

b.  $H(10) = 23 \sin \frac{\pi}{6}(10-6) + 27$   
 $= 46.919$

or  $\boxed{\text{about 47 woodies per day}}$

c.  $30 = 23 \sin \frac{\pi}{6}(t-6) + 27$

$\frac{3}{23} = \sin \frac{\pi}{6}(t-6)$

$\frac{\pi}{6}(t-6) = 0.130807$

$t = 6.2498$

$H(t) > 30$  when  $t \in (6.250, 11.750)$

Extra staff is needed in

$\boxed{\text{June, July, August, September, October, November}}$