5.4 : Real Life Solutions

median $= \dfrac{max + min}{2}$

$= \dfrac{30 + 8}{2}$

$= 19$

$\therefore d = 19$

20 cycles in 1 minute.

so $\underset{\div 30}{\therefore}\left[\begin{array}{l}\text{20 cycles in 60 seconds} \\ \text{1 cycle in 3 seconds}\end{array}\right]\div 20 \implies$ period $= 3$ sec.

so $b = \dfrac{2\pi}{period}$

$b = \dfrac{2\pi}{3}$

I chose to use the cosine function with a "c" value of 0.

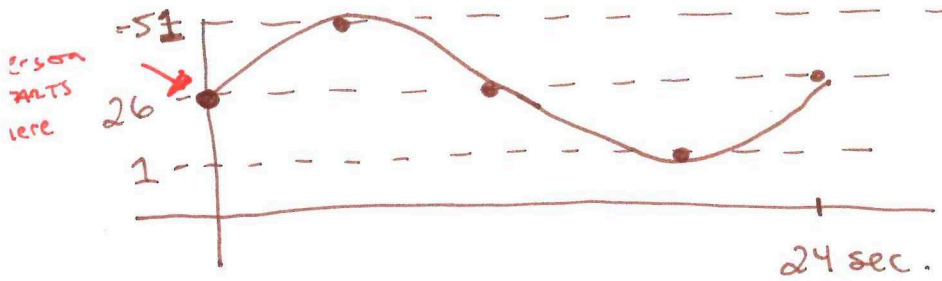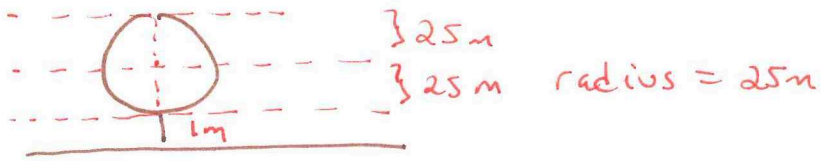$$y = 11 \cos \dfrac{2\pi}{3} t + 19$$

Other possible equations.

$$y = 11 \cos\left(\dfrac{2\pi}{3}(t-3)\right) + 19$$

$$y = -11 \cos\left(\dfrac{2\pi}{3}(t-1.5)\right) + 19$$

$$y = -11 \sin\left(\dfrac{2\pi}{3}(t-0.75)\right) + 19$$

$$y = 11 \sin\left(\dfrac{2\pi}{3}(t-2.25)\right) + 19$$

2)   Ferri's Wheel $\}$ 25m
                             $\}$ 25m   radius = 25m

                             $\uparrow$ 1m

person
ARTS $\xrightarrow{}$ 26   person STARTS t=0
here   at 26m.

        -51

        26

        1

                        24 sec.

        a = 25   d = 26   c = 0 $b = \dfrac{2\pi}{period}$

                                        $b = \dfrac{2\pi}{24}$

$$h(t) = 25\sin\left(\dfrac{\pi}{12}\,t\right) + 26$$ $b = \dfrac{\pi}{12}$
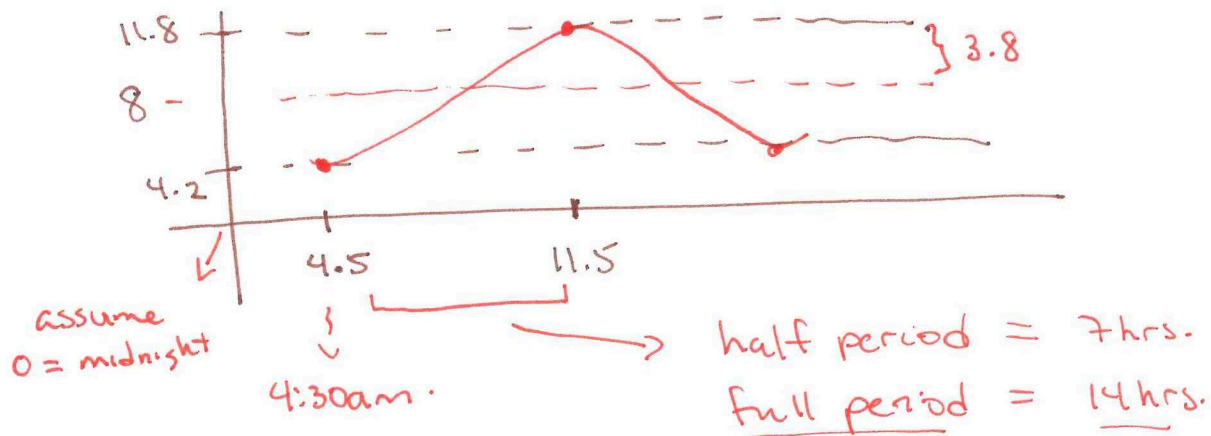
There are many other options

$$h(t) = -25\sin\left(\dfrac{\pi}{12}(t-12)\right) + 26$$

$$h(t) = 25\cos\left(\dfrac{\pi}{12}(t-6)\right) + 26$$

$$h(t) = -25\cos\left(\dfrac{\pi}{12}(t-18)\right) + 26$$

b) $h(16) = 25\sin\left(\dfrac{\pi}{12}(16)\right) + 26$

      $= 4.349\ m$

③ Tides

$$median = \frac{max + min}{2}$$
$$= \frac{11.8 + 4.2}{2}$$
$$= 8$$

assume 0 = midnight

4:30am.

half period = 7 hrs.
full period = 14 hrs.

$$a = -3.8 \qquad d = 8 \qquad b = \frac{2\pi}{period}$$
$$= \frac{2\pi}{14}$$
$$= \frac{2\pi}{7}$$

$$c = 4.5 \rightarrow \text{when using } \cancel{\text{cos}} \; y = -\cos t$$

$$\boxed{h(t) = -3.8 \cos\left[\frac{\pi}{7}(t - 4.5)\right] + 8}$$

b) 1:15 pm → use 24 hour time → 13.25 hrs

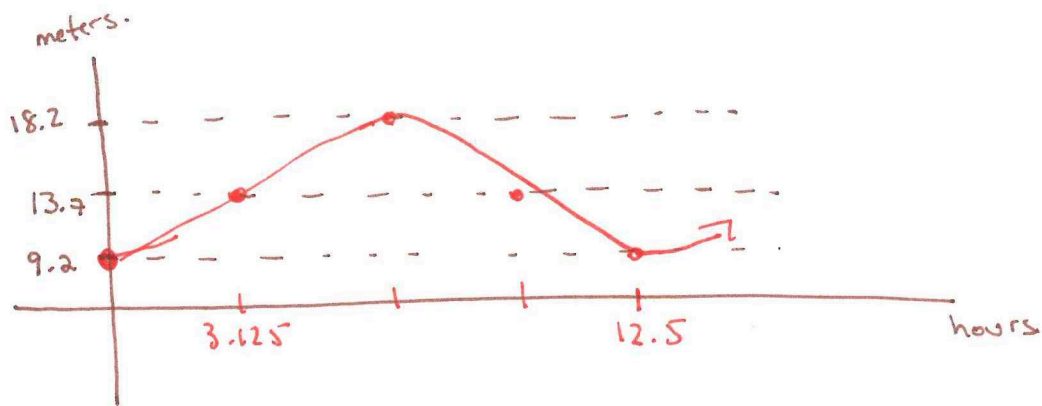$$h(13.25) = -3.8 \cos\left[\frac{\pi}{7}(13.25 - 4.5)\right] + 8$$
$$= \boxed{10.687 \, m}$$

Other possible equations

$$h(t) = 3.8 \cos\left(\frac{\pi}{7}(t - 11.5)\right) + 8$$
$$h(t) = 3.8 \sin\left(\frac{\pi}{7}(t - 8)\right) + 8$$
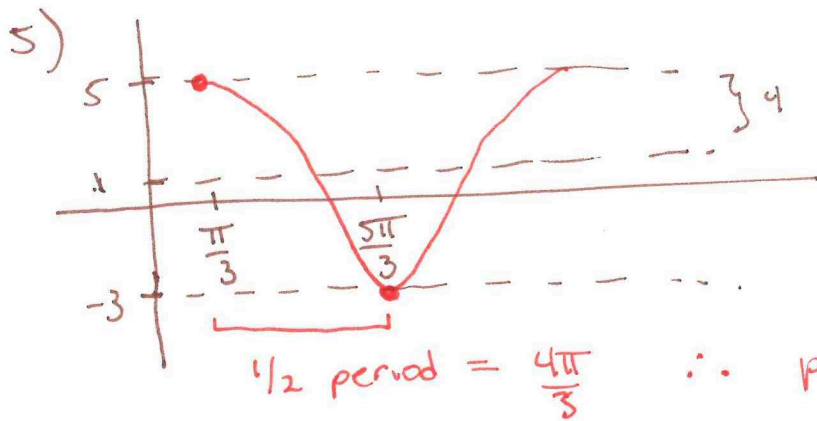
4) $d(t) = -4.5 \cos(0.16\pi t) + 13.7$

meters.

period $= \dfrac{2\pi}{b}$

$= \dfrac{2\pi}{0.16\pi}$

$= 12.5$ hrs.

The points are

$\dfrac{12.5}{4} = 3.125$ apart.

note: at least 2 points should be clearly shown.

5)

$\frac{1}{2}$ period $= \dfrac{4\pi}{3}$ ∴ period $= \dfrac{8\pi}{3}$

median $= \dfrac{max + min}{2}$

$= \dfrac{5-3}{2}$

$= 1$

$a = 4$ $d = 1$ $b = \dfrac{2\pi}{period}$

$= \dfrac{2\pi}{\frac{8\pi}{3}}$

$= 2\pi\left(\dfrac{3}{8\pi}\right)$

$= \dfrac{6}{8} = \dfrac{3}{4}$

$c = \dfrac{\pi}{3}$

$\boxed{y = 4\cos\left(\dfrac{3}{4}\left(x - \dfrac{\pi}{3}\right)\right) + 1}$

or

$y = -4\cos\left[\dfrac{3}{4}\left(x - \dfrac{5\pi}{3}\right)\right] + 1$