Week 5 S.I. Answers

1. a.

$a = 8.7 \quad b = \frac{2\pi}{365} \quad d = 12$

$\Rightarrow$ amplitude: $|a| = \boxed{8.7 \frac{hrs}{day}}$

$\Rightarrow$ minimum # of days: $12 - 18.71 = \boxed{3.3 \text{ days}}$

$\Rightarrow$ Period: $\frac{2\pi}{b} \Rightarrow \frac{2\pi}{\frac{2\pi}{365}} = \boxed{365 \text{ days}}$

b. $a = 21 \quad b = 104\pi \quad d = 88$

$\Rightarrow$ minimum blood pressure: $88 - 21 = \boxed{67 \text{ mmHg}}$

$\Rightarrow$ Period: $\frac{2\pi}{b} \Rightarrow \frac{2\pi}{104\pi} = \boxed{\frac{1}{52} \text{ or } .019}$ [roughly 2 min]

$\Rightarrow$ frequency $\frac{1}{\frac{1}{52}} = \boxed{52 \text{ bpm}}$

2.

a. Period: $P = \frac{2\pi}{b} \Rightarrow 2\pi = \frac{2\pi}{b} \Rightarrow b = 1$

P.S.: $\frac{c}{b} = 0$ [No Phase Shift

a: must be 1 or -1, + goes down so -1

V.S.: moved down 2, so -1

$\therefore \boxed{y = -\sin x - 2}$

b. Period: $P = \frac{2\pi}{b} \Rightarrow \frac{1}{2} = \frac{2\pi}{b} \Rightarrow b = \frac{2\pi}{1/2} \Rightarrow b = 4\pi$

P.S.: $\frac{c}{b} = \frac{1}{16}$

a: -1 [No Change, just negative]

V.S.: No Vertical Shift

$\therefore y = \boxed{-\cos\left(4\pi x - \frac{\pi}{4}\right)}$

3. a.

i. The wheel turns at $\frac{1 \text{ rev}}{\text{min}}$, which = 2π rad

$\omega = \frac{2\pi \text{ rad}}{1 \text{ min}} = \boxed{6.283 \frac{\text{rad}}{\text{min}}}$

ii. $v = r\omega \Rightarrow v = 35\text{ft}(2\pi) = 70\pi \frac{\text{ft}}{\text{min}} = \boxed{219.9 \frac{\text{ft}}{\text{min}}}$

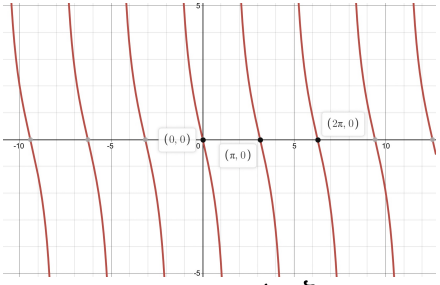
b.

i $v = 24 \frac{\text{mi}}{\text{hr}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}} \cdot \frac{12 \text{ in}}{1 \text{ ft}} = 25,344 \frac{\text{in}}{\text{min}}$

$v = r\omega \Rightarrow \omega = \frac{v}{r} \Rightarrow = \frac{25,344}{12} = \boxed{2112 \frac{\text{rad}}{\text{min}}}$

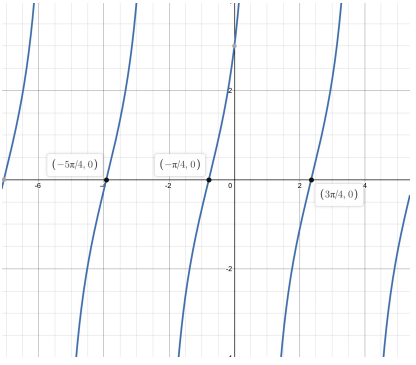
ii. $2112 \frac{\text{rad}}{\text{min}} \cdot \frac{1 \text{ rev}}{2\pi \text{ rad}} = \boxed{336.135 \frac{\text{rev}}{\text{min}}}$

4.



asymptotes at $-\frac{\pi}{2}, \frac{\pi}{2}$, etc.

b.



asymptotes at $-\frac{3\pi}{4}, \frac{\pi}{4}$, etc.