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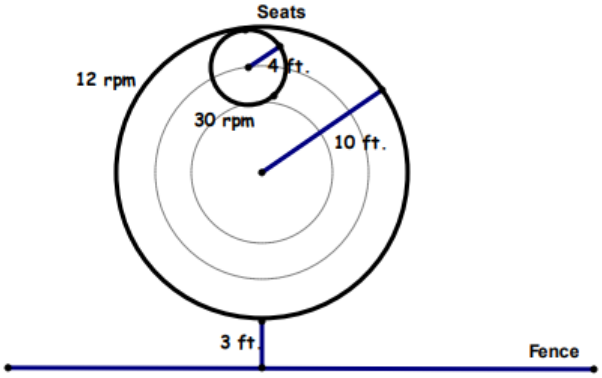
Nauseating Ride Problem

Henry Yu



1

Find your linear velocity in ft/s due to the combined rotation of the seats on the merry-go-round when you are:

- farthest from the center.
- closest to the center.

$$\frac{12\ rotations}{1\ minute} \times \frac{20\pi\ feet}{1\ rotation} \times \frac{1\ minute}{60\ seconds} = 4\pi \text{ feet/second} \quad \text{(larger circle [merry-go-round])}$$

$$\frac{30\ rotations}{1\ minute} \times \frac{8\pi\ feet}{1\ rotation} \times \frac{1\ minute}{60\ seconds} = 4\pi \text{ feet/second} \quad \text{(smaller circle [seat])}$$

$$\frac{12\ rotations}{1\ minute} \times \frac{12\pi\ feet}{1\ rotation} \times \frac{1\ minute}{60\ seconds} = 2.4\pi \text{ feet/second} \quad \text{(central circle)}$$

Farthest $= 8\pi$ *feet/second* (counterclockwise)

Closest $= 1.6\pi$ *feet/second* (clockwise)

2

In what direction are you actually moving when your seat is closest to the merry-go-round's center?

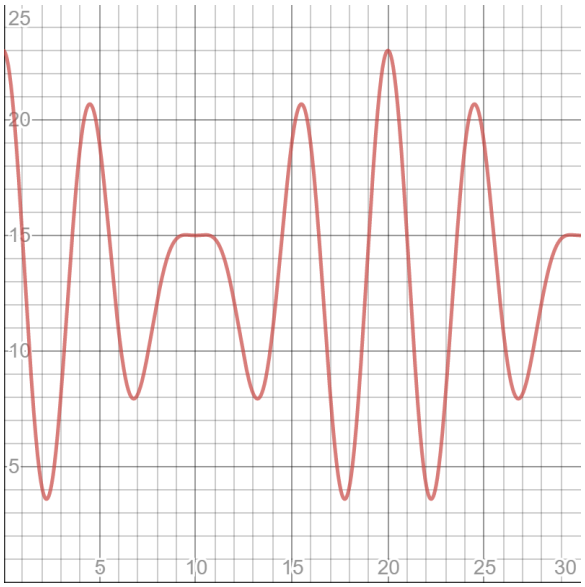
Based on the velocity of both circles, the seat would be moving clockwise since the velocity of the seat is greater than the central circle of the merry-go-round.

3

Write the equation expressing your distance from the fence in terms of t.

Addition of two cosine sinusoids:

$$y = 6\cos\left(\frac{2\pi x}{5}\right) + 4\cos\left(\frac{\pi x}{2}\right) + 13$$



The whole function is an addition of two sinusoids. The bigger one has an amplitude of six feet (10 - 4) and has a period of 5 seconds (60 $[\frac{1}{12}]$). The second graph has an amplitude of four feet and a period of two seconds (60 $[\frac{1}{30}]$). Both graphs are cosine graphs, and the whole function has a vertical shift of thirteen feet (10 + 3). The period of the whole function is twenty seconds (2 [5·2]).

Contributions: Parts a and be were completed by West and verified by both other members, while parts c and d were completed by Varun. The document was compiled by Henry.