Lesson 20

Read Chapter 16

Circular motion

Uniform circular motion

We consider an object going around a circle with constant speed.
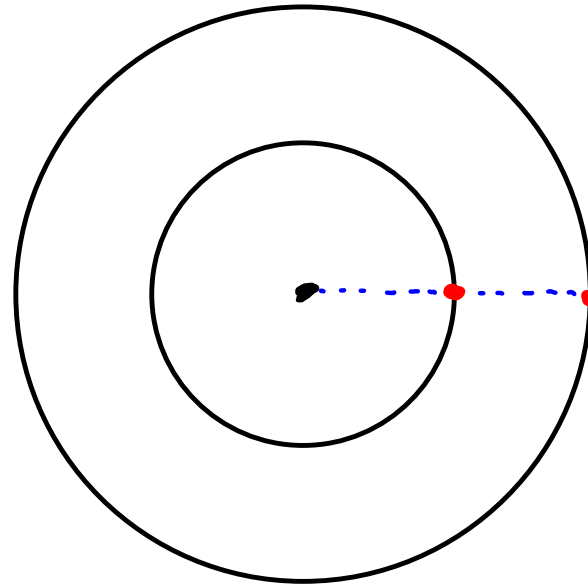
T. Period: time it takes to go around circle once

ω. Angular speed/velocity, measures how fast angles are swept. Units rad/time, RPM
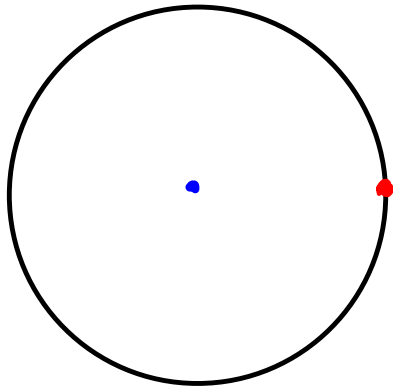
v. Linear speed/velocity, measures how fast distances are covered. Units distance/time

Uniform circular motion formulas

1. $d = vt$
2. $\theta = \omega t$
3. $\omega = \frac{2\pi}{T}$
4. $T = \frac{2\pi}{\omega}$
5. $v = \omega r$
6. $1 RPM = 2\pi$ rad /min

A rotating sprinkle reaches 10 m far and completes a full revolution in 5 min. How much area does it irrigate in 2 min ? How long does it take the sprinkle to irrigate 50 square meters ?

An object moves around a circle of radius 10 ft with $\omega = 12$ RPM. Find its linear velocity in feet/sec. How many radians does the object turn in 3 sec ? What distance does it cover in 3 min ? How long does it take the object to move 3 feet ? How long does it take the object to turn an angle of $45°$? When the object has moved a distance of 5 feet , what angle has it turned ?
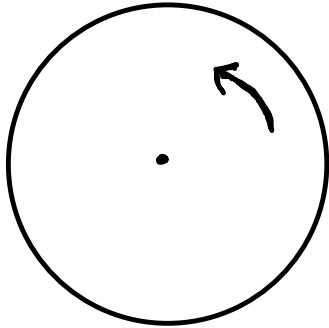
Two objects move around a circle . They start at the same time. Object 1 moves in the counterclockwise direction, with angular speed of $\frac{\pi}{50}$ rad/sec; from where it starts it takes it 20 seconds to reach the easternmost part of the track. Object 2 moves in the clockwise direction, starting from the northernmost part of the track 's with a speed of 4 feet / sec . The two objects pass each other after 25 sec. What is object 1's starting position ? (Give your answer as an angle). What is the radius of the track ?
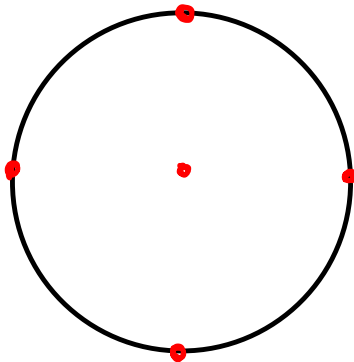
A ferris wheel of radius r= 30 feet rotates counterclockwise with an angular speed of $\omega = 1$ RPM. The lowest point on the wheel is 5 feet above the level ground. The wheel starts turning when Tiff is at the location P, which makes an angle θ with the horizontal It takes her 20 seconds to reach the top of the ride. Find the angle θ Poor engineering causes Tiff's seat to fly off along the line L tangent to the wheel 10 seconds after the wheel starts turning. Find the angle that L forms with the horizontal.

L

Q

π/6

P
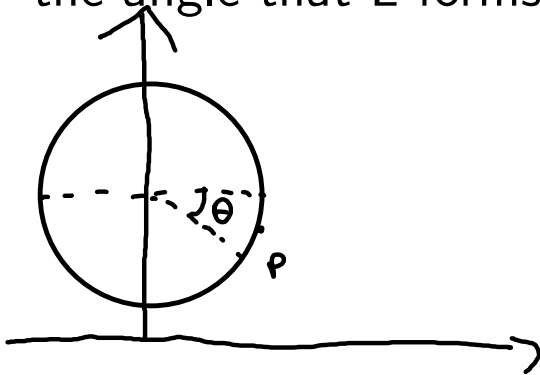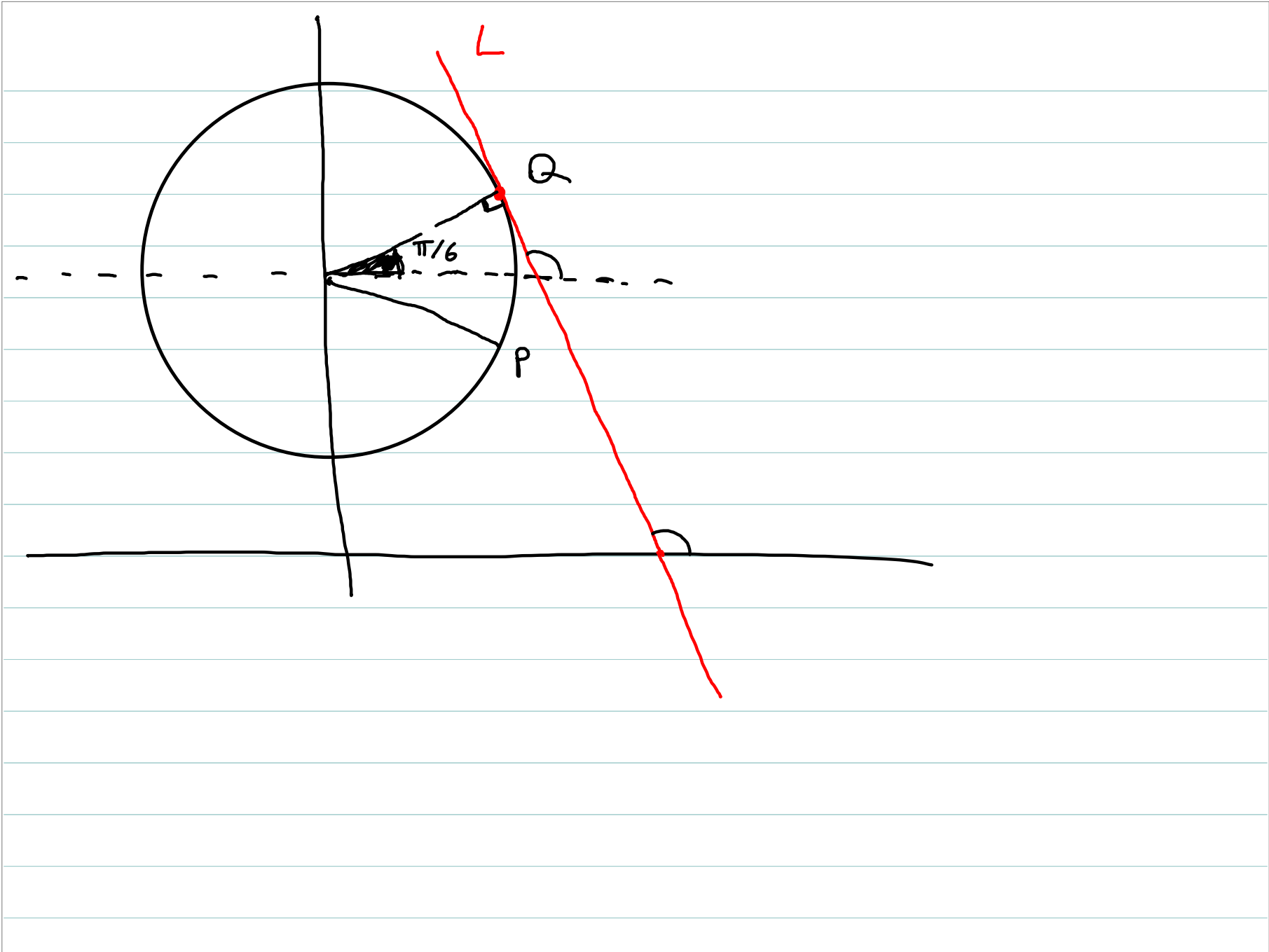
Jeb is running clockwise around a circular track. From his starting point, it takes him 14 seconds to reach the westernmost point of the track. It takes him 80 seconds from his starting point to reach the northernmost point of the track. He runs at 3 meters per second.

Beatrice starts running counterclockwise, at the same time as Jeb, from the easternmost point of the track at 4 meters per second. How long has Beatrice been running when she passes Jeb for the first time?