Section 5.4: Radian Angle Measure and Trigonometric functions of Real Numbers

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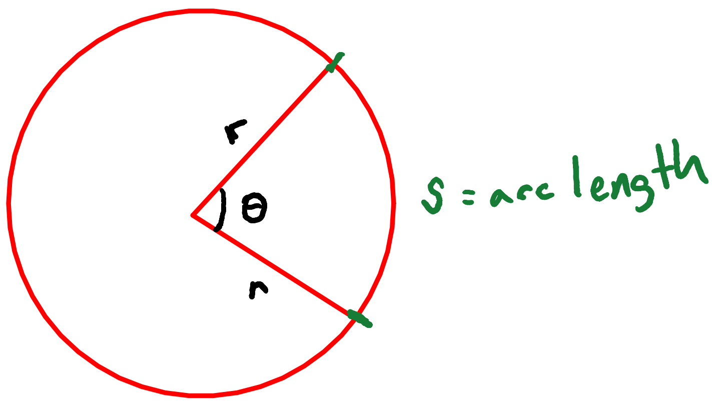
11:26 AM

Goals:

1. To convert between radian and degrees.
2. To compute arc length of a sector of a circle
3. To solve apps.
4. To evaluate a trig function of any real number.

Radian Measure



} we say the arc from A to B subtends the central angle, θ

Radian measure of θ is given by $\theta = \frac{s}{r}$.

Notes: ① An angle that measures 1 radian is subtended by an arc length of 1 radius.

② # of radians in 1 revolution is

given by $\theta = \frac{s}{r} = \frac{2\pi r}{r} = 2\pi$.

So, $360° = 2\pi$ radians or

★ $180° = \pi$ radians

③ $s = r\theta$ ← arc length formula

ex convert to radians or degrees.

a) $-270°$

$-270° \cdot \frac{\pi}{180} = \frac{-27\pi}{18} = -\frac{3\pi}{2}$ ← in radians

b) $427°$ (approximate)

$427° \cdot \frac{\pi}{180°} = \frac{427\pi}{180} \approx 7.45$

exact, estimate

c) $\frac{9\pi}{2}$ (Assume to be radians when

-                no units given)

$$\frac{9\pi}{2} \cdot \frac{180^\circ}{\pi} = 810^\circ$$

(ex) Find the complement and supplement of $\frac{\pi}{3}$

complement: $\frac{\pi}{2} - \frac{\pi}{3} = \frac{3\pi}{6} - \frac{2\pi}{6} = \boxed{\frac{\pi}{6}}$

supplement: $\pi - \frac{\pi}{3} = \frac{3\pi}{3} - \frac{\pi}{3} = \boxed{\frac{2\pi}{3}}$

Def: Angular Velocity (change in θ over time)

$$(\text{angular velocity}) = \omega = \frac{\theta}{t}$$

"omega"

Ex. A wheel is rotating at 200 rpm. Find the angular velocity in radians per second.

$$\frac{200 \text{ rev}}{1 \text{ min}} \cdot \frac{2\pi \text{ radians}}{1 \text{ rev}} \cdot \frac{1 \text{ min}}{60 \text{ sec}}$$

$$\approx 20.94 \ \frac{\text{radians}}{\text{sec}}$$

Ex. A truck has a tire of radius 45 cm rotating at 500 rpm. Find the speed of the truck.

$$\frac{500 \text{ rev}}{1 \text{ min}} \cdot \frac{2\pi(45) \text{ cm}}{1 \text{ rev}} \cdot \frac{1 \text{ km}}{100\,000 \text{ cm}} \cdot \frac{60 \text{ min}}{1 \text{ hr}}$$

$$\approx 84.8 \ \frac{\text{km}}{\text{hr}}$$