Trig Review Solutions
PHYS 2425

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1. Converting between radians and degrees

$$\theta_{\text{rad}} = \theta_{\text{deg}} \cdot \frac{\pi}{180} \qquad \theta_{\text{deg}} = \theta_{\text{rad}} \cdot \frac{180}{\pi}$$

A. What is $\frac{pi}{2}$ radians in degrees?

ANS: $90°$

B. What is $60°$ in radians?

ANS: $\frac{pi}{3}$

C. What is 2π radians in degrees?

ANS: Both $360°$ and $0°$. This shows an important notion about the circular nature of angles.

Group Discussion: Why is $tan(90°)$ undefined? Why do we use radians?

ANS: $tan(90°)$ is undefined becase $cos(\theta) = 0$. There are a couple reasons why we use radians. However the main thing I expect students to notice is that the *arc length* is the same as the *angle* (in radians) for the unit circle. That is, an angle of π radians creates an arc length of π units. This scales proportionately with r. We can conclude that when dealing with rotating objects, the distance traveled along the circumference is equal to:

$$x = r\theta$$

Where x is the arc length and r is the radius, and θ is in radians. s is sometimes used instead of x in this equation.

2. Usage of the three main trig functions

A. On the unit circle, what are the coordinates of the point at angle $210°$?

ANS: $(\frac{-\sqrt{3}}{2}, \frac{-1}{2})$

B. Compute $\sin(\pi/3), \cos(\pi/3), \tan(\pi/3)$.

ANS: $\frac{\sqrt{3}}{2}$, $\frac{1}{2}$, $\sqrt{3}$

C. Find $\sin(225°)$ and $\cos(225°)$.

ANS: $\frac{-\sqrt{2}}{2}$, $\frac{-\sqrt{2}}{2}$

D. Without a calculator, evaluate $\tan(300°)$.

ANS: $-\sqrt{3}$

E. Simplify: $\dfrac{\sin\theta}{\cos\theta}$.

ANS: $tan(\theta)$

F. Solve for θ: $\tan\theta = 1$.

ANS: 45° or $\frac{pi}{4}$ radians

G. Solve $\sin\theta = \frac{\sqrt{3}}{2}$ for all solutions in $[0, 2\pi)$.

ANS: 60°, 120°

Group Activity: A force of 100 N is applied at a 60° angle above the horizontal. What are the horizontal and vertical components?

ANS: $100cos(60°)N\hat{i} + 100sin(60°)N\hat{j}$

3. Relevant Tables and Information

θ (rad)	θ (deg)	$\sin(\theta)$	$\cos(\theta)$	$\tan(\theta)$
0	$0°$	0	1	0
$\frac{\pi}{6}$	$30°$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
$\frac{\pi}{4}$	$45°$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1
$\frac{\pi}{3}$	$60°$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
$\frac{\pi}{2}$	$90°$	1	0	undefined

Table 1: Common values of sine, cosine, and tangent in radians and degrees.

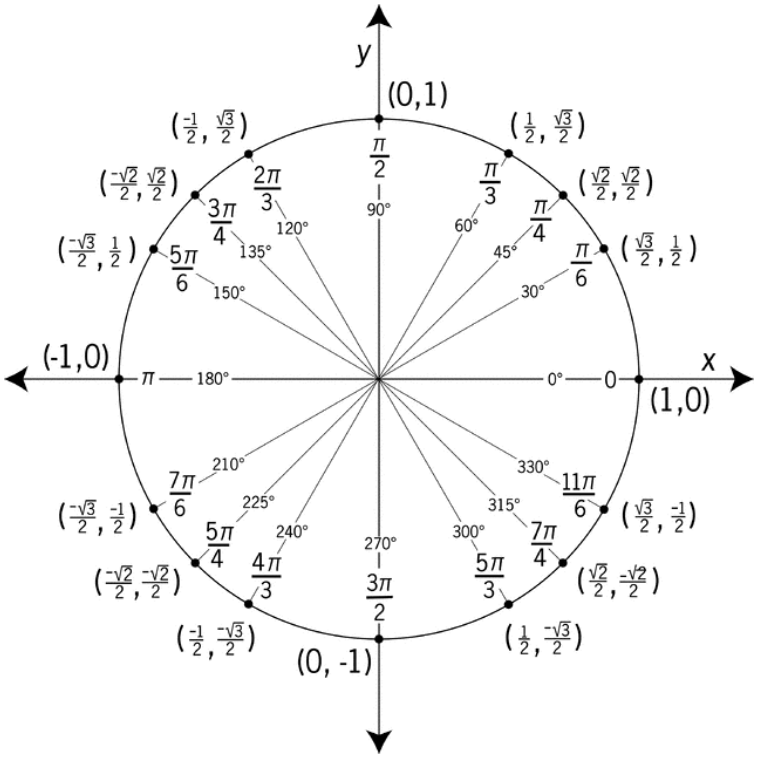

Figure 1: The Unit Circle