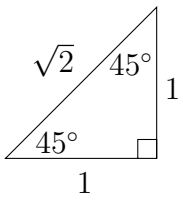
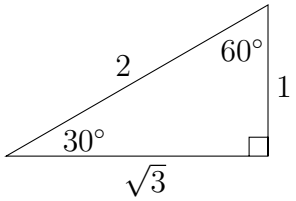
**What Trigonometry You Need to Know (Memorized)**

$$\sin(\theta) = \frac{\text{opp}}{\text{hyp}} = \frac{\text{Oscar}}{\text{had}}$$
$$\cos(\theta) = \frac{\text{adj}}{\text{hyp}} = \frac{\text{a}}{\text{hold}}$$
$$\tan(\theta) = \frac{\text{opp}}{\text{adj}} = \frac{\text{on}}{\text{Arthur}} = \frac{\sin(\theta)}{\cos(\theta)}$$
$$\csc(\theta) = \frac{1}{\sin(\theta)}$$
$$\sec(\theta) = \frac{1}{\cos(\theta)}$$
$$\cot(\theta) = \frac{1}{\tan(\theta)} = \frac{\cos(\theta)}{\sin(\theta)}$$

The $45 - 45 - 90$ triangle:




The $30 - 60 - 90$ triangle:




$$\sin^2(\theta) + \cos^2(\theta) = 1, \quad \sin(-\theta) = -\sin(\theta), \quad \cos(-\theta) = \cos(\theta), \quad \pi \text{ rad} = 180^\circ$$
$$\sin(x+y) = \sin(x)\cos(y) + \cos(x)\sin(y), \quad \cos(x+y) = \cos(x)\cos(y) - \sin(x)\sin(y)$$

The graphs of the $\sin$ and $\cos$ functions:

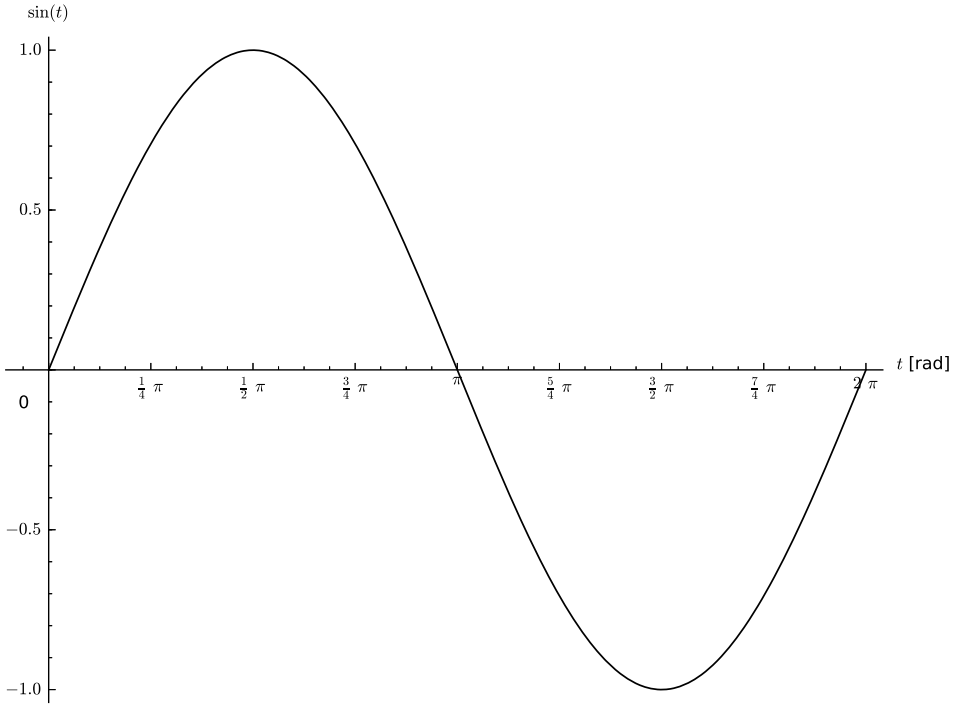



Figure 1: $\sin(t)$ versus $t$

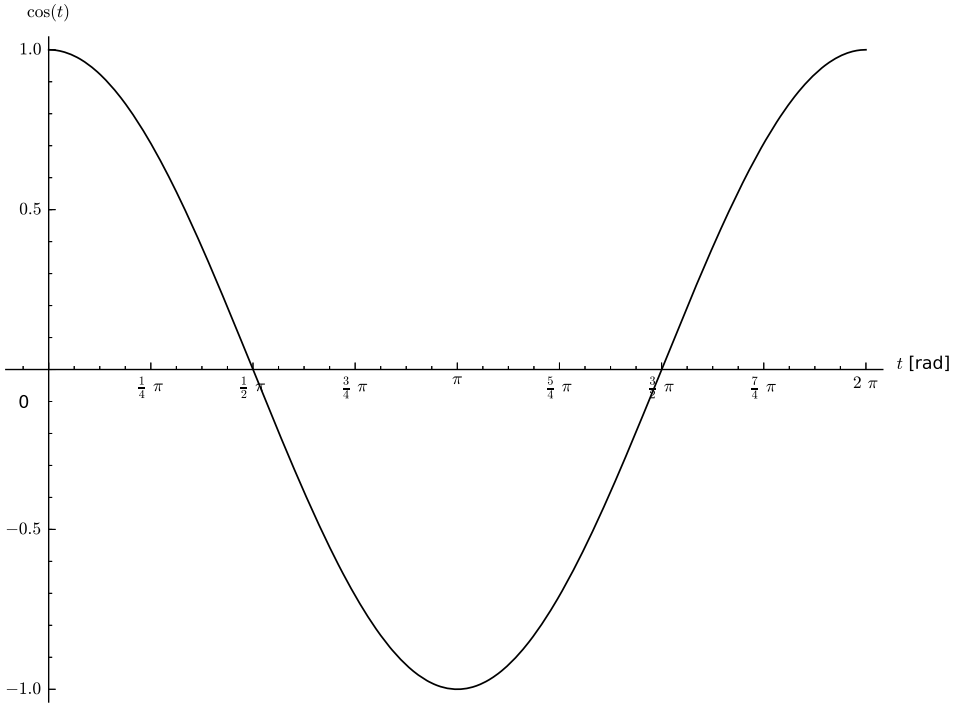



Figure 2: $\cos(t)$ versus $t$

**Trigonometry You Should be Able to Derive on Demand**

Graphs of the $\tan, \csc, \sec,$ and $\cot$ functions.
Trigonometric Functions of Important Angles

| $\theta$ | radians | $\sin(\theta)$ | $\cos(\theta)$ | $\tan(\theta)$ |
|---|---|---|---|---|
| $0°$ | $0$ | $0$ | $1$ | $0$ |
| $30°$ | $\pi/6$ | $1/2$ | $\sqrt{3}/2$ | $\sqrt{3}/3$ |
| $45°$ | $\pi/4$ | $\sqrt{2}/2$ | $\sqrt{2}/2$ | $1$ |
| $60°$ | $\pi/3$ | $\sqrt{3}/2$ | $1/2$ | $\sqrt{3}$ |
| $90°$ | $\pi/2$ | $1$ | $0$ | $-$ |

$$1+\tan^2(\theta)=\sec^2(\theta), \quad 1+\cot^2(\theta)=\csc^2(\theta), \quad \tan(-\theta)=-\tan(\theta),$$
$$\sin\Big(\frac{\pi}{2}-\theta\Big)=\cos(\theta), \quad \cos\Big(\frac{\pi}{2}-\theta\Big)=\sin(\theta), \quad \tan\Big(\frac{\pi}{2}-\theta\Big)=\cot(\theta)$$
$$\sin(x-y)=\sin(x)\cos(y)-\cos(x)\sin(y), \quad \cos(x-y)=\cos(x)\cos(y)+\sin(x)\sin(y)$$
$$\tan(x+y)=\frac{\tan(x)+\tan(y)}{1-\tan(x)\tan(y)}, \quad \tan(x-y)=\frac{\tan(x)-\tan(y)}{1+\tan(x)\tan(y)}$$
$$\sin(2\theta)=2\sin(\theta)\cos(\theta), \quad \cos(2\theta)=\cos^2(\theta)-\sin^2(\theta)=2\cos^2(\theta)-1=1-2\sin^2(\theta)$$
$$\tan(2\theta)=\frac{2\tan(\theta)}{1-\tan^2(\theta)}, \quad \sin^2(\theta)=\frac{1-\cos(2\theta)}{2}, \quad \cos^2(\theta)=\frac{1+\cos(2\theta)}{2}$$