

Notes 6.2 – The Whole Circle and ALL the Functions

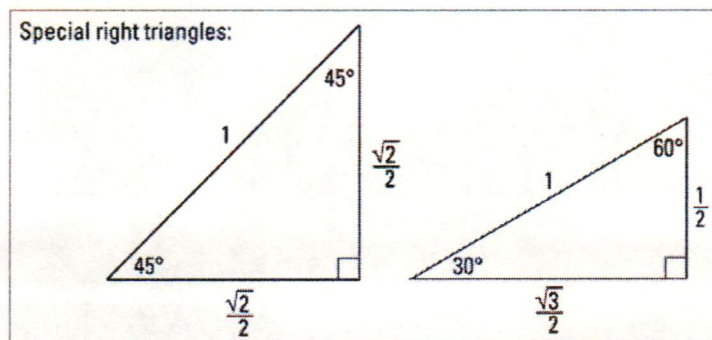
The other three trig functions... Let θ be any angle value.

$$\text{Sine: } \sin \theta = \frac{O}{H} \qquad \text{Cosine: } \cos \theta = \frac{A}{H} \qquad \text{Tangent: } \tan \theta = \frac{O}{A}$$

$$\text{Cosecant: } \csc \theta = \frac{H}{O} \qquad \text{or} \qquad \csc \theta = \frac{1}{\sin \theta}$$

$$\text{Secant: } \sec \theta = \frac{H}{A} \qquad \text{or} \qquad \sec \theta = \frac{1}{\cos \theta}$$

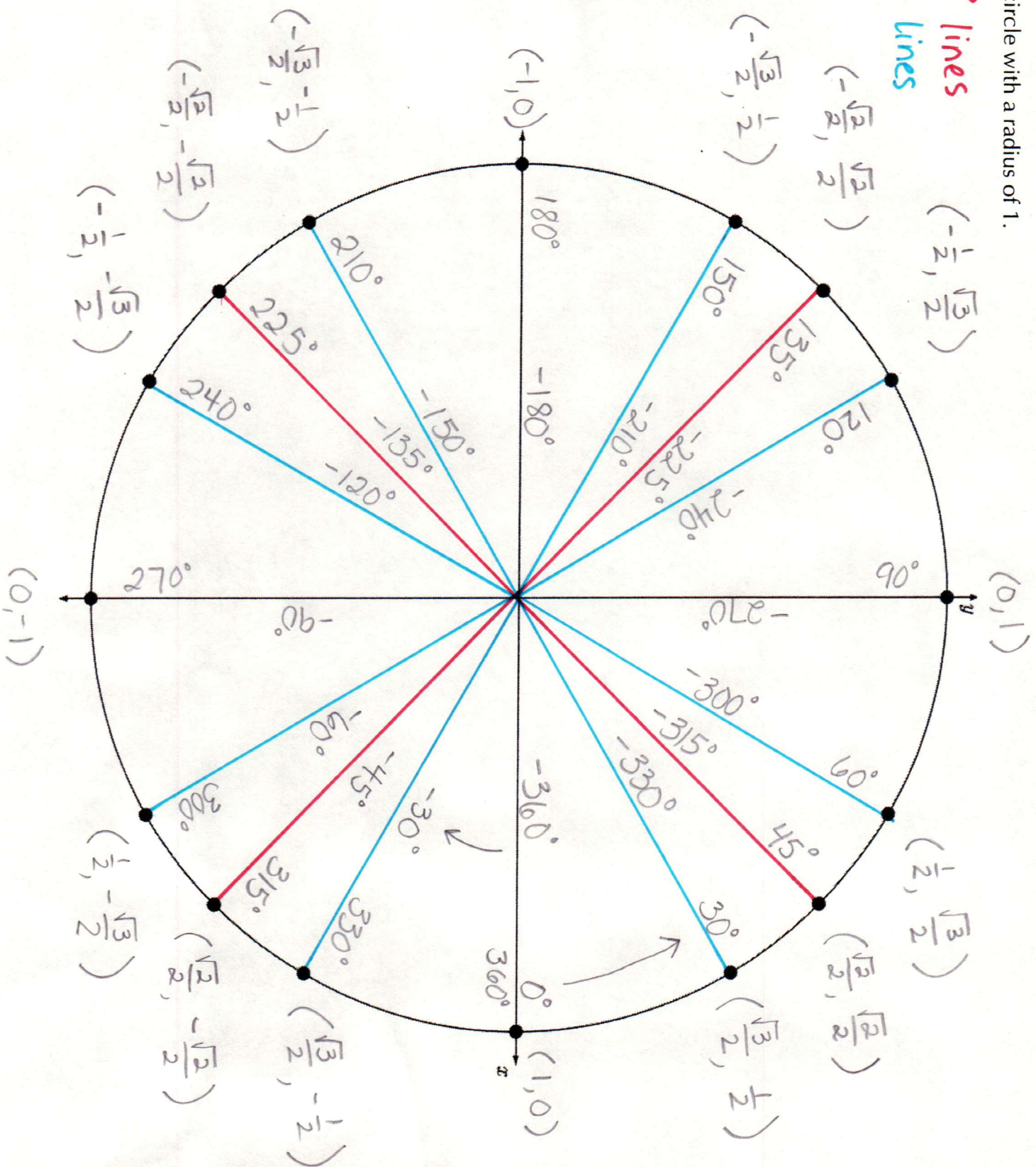
$$\text{Cotangent: } \cot \theta = \frac{A}{O} \qquad \text{or} \qquad \cot \theta = \frac{1}{\tan \theta}$$

A unit circle has a radius of one.The point (x, y) relates to ($\cos \theta$, $\sin \theta$)

$$\tan \theta = \frac{\sin \theta}{\cos \theta} \qquad (\theta = \text{angle measure})$$

A circle with a radius of 1.

45° lines
30° lines



(0, 1)

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

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

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

(-1, 0)

90°

120°

150°

180°

-240°

-225°

-210°

-150°

-135°

-120°

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

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

(0, -1)

270°

240°

225°

210°

-90°

-270°

-300°

-315°

-330°

-360°

-60°

-45°

-30°

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

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

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

(1, 0)

60°

45°

30°

300°

330°

360°

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

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

Use the filled in unit circle to find the following values.

1. 135°

$$\sin 135^\circ = \frac{\sqrt{2}}{2}$$

$$\cos 135^\circ = -\frac{\sqrt{2}}{2}$$

$$\tan 135^\circ = -1$$

$$\csc 135^\circ = \frac{2}{\sqrt{2}} \rightarrow \sqrt{2}$$

$$\sec 135^\circ = -\sqrt{2}$$

$$\cot 135^\circ = -1$$

2. -120°

$$\sin -120^\circ = -\frac{\sqrt{3}}{2}$$

$$\cos -120^\circ = -\frac{1}{2}$$

$$\tan -120^\circ = \frac{-\frac{\sqrt{3}}{2}}{-\frac{1}{2}} \rightarrow \sqrt{3}$$

$$\csc -120^\circ = \frac{-2}{\sqrt{3}} \rightarrow -\frac{2\sqrt{3}}{3}$$

$$\sec -120^\circ = -2$$

$$\cot -120^\circ = \frac{1}{\sqrt{3}} \rightarrow \frac{\sqrt{3}}{3}$$

3. 180°

$$\sin 180^\circ = 0$$

$$\cos 180^\circ = -1$$

$$\tan 180^\circ = 0$$

$$\csc 180^\circ = \text{undefined}$$

$$\sec 180^\circ = -1$$

$$\cot 180^\circ = \text{undefined}$$

4. -30°

$$\sin -30^\circ = -\frac{1}{2}$$

$$\cos -30^\circ = \frac{\sqrt{3}}{2}$$

$$\tan -30^\circ = -\frac{\sqrt{3}}{3}$$

$$\csc -30^\circ = -2$$

$$\sec -30^\circ = \frac{2\sqrt{3}}{3}$$

$$\cot -30^\circ = -\sqrt{3}$$

5. Find the value of each.

a. $\cot 30^\circ + \tan 45^\circ =$
 $(\sqrt{3}) + 1 = \boxed{1 + \sqrt{3}}$

b. $\sin 45^\circ \cos 45^\circ =$
 $\left(\frac{\sqrt{2}}{2}\right)\left(\frac{\sqrt{2}}{2}\right) = \frac{1}{2}$