$\frac{\sin x}{1} = \csc x$

$\frac{\cos x}{1} = \sec x$

$\frac{\sin x}{\cos x} = \tan x$

$\frac{\cos x}{\sin x} = \cot x$

Definitions you must know:

Appendix A: Quick Trigonometry Review
\( 1 + \cot^2 \theta = \csc^2 \theta \)

\( \tan^2 \theta + 1 = \sec^2 \theta \)

\( \sin^2 \theta - \cos^2 \theta = 1 \)

Divide \(1\) by \(\sin^2 \theta\) to get

\( \sin \theta = (\sin \theta)^2 \), not \(\sin \theta^2\)

**Notation:**

\(\theta\) \(\sin \theta\) \(\cos \theta\) \(\csc \theta\) \(\sec \theta\) \(\tan \theta\)

**Pythagorean Identities:**

- \(\sin^2 \theta + \cos^2 \theta = 1\)
- \(1 + \cot^2 \theta = \csc^2 \theta\)
- \(\tan^2 \theta + 1 = \sec^2 \theta\)
All of these identities (and more) are in the back cover of your textbook.

\[
\begin{align*}
\cos 2\theta &= 2\cos^2 \theta - 1 \\
\sin 2\theta &= 2\sin \theta \cos \theta \\
\cos 2\theta &= \cos^2 \theta - \sin^2 \theta
\end{align*}
\]

Use 1 to get

Double-Angle Identities
In first quadrant (30°, 45°, 60°):

- All of the trig functions at the base angle:
  - $\sin$ = opp/hyp
  - $\cos$ = adj/hyp
  - $\tan$ = opp/adj

Option (1): Use right triangles:

- $\frac{\sin}{\cos} = \frac{1}{\sqrt{2}}$
- $\frac{\tan}{\cos} = \frac{1}{\sqrt{3}}$
\[ 1 = \frac{2}{2} = \frac{2}{h} = \cos \theta. \]

\[ \frac{2}{1} = \frac{2}{h} = \sin 36^\circ. \]

\[ e.g. \sin 36^\circ \]

\[ \begin{array}{c}
  2 \\
  \hline
  0 & 1 & 2 & 3 & 4 \\
  0 & 0.30 & 0.45 & 0.60 & 0.90 \\
  0 & 0.25 & 0.50 & 0.75 & 1.00 \\
  0 & 0.25 & 0.50 & 0.75 & 1.00 \\
  0 & 0.25 & 0.50 & 0.75 & 1.00 \\
  0 & 0.25 & 0.50 & 0.75 & 1.00 \\
\end{array} \]

Oppose (c2): Use following chart.
Angles in other quadrants

Know where the trig functions are positive

\[ \begin{array}{c|cc}
   & I & II \\
   \hline
   S & A & T \\
   C & & IV \\
\end{array} \]

To evaluate a trig function at any angle \( \theta \):

1. Evaluate at the reference angle \( \theta' \)
2. Affix appropriate sign (+ or -) based on the quadrant of the terminal side of the original angle \( \theta \).
\[ z = \frac{\cos \frac{3\pi}{4}}{\sin \frac{\pi}{4}} = \frac{\frac{\sqrt{2}}{2}}{\frac{1}{\sqrt{2}}} = -2 \]

So \( \sec \frac{3\pi}{4} = \frac{\sqrt{2}}{\frac{1}{\sqrt{2}}} = \frac{\sqrt{2}}{\frac{\sqrt{2}}{2}} = \frac{2}{\sqrt{2}} = \frac{\sqrt{2}}{2} \)

\[ \frac{z}{\sqrt{2}} = \frac{\sqrt{2}}{\frac{\sqrt{2}}{2}} = \frac{\sqrt{2}}{\frac{\sqrt{2}}{2}} = \frac{2}{\sqrt{2}} = \frac{\sqrt{2}}{2} \]

Find \( \sin \frac{3\pi}{4} \)

Example: Find \( \sin \frac{3\pi}{4}, \cos \frac{3\pi}{4}, \sec \frac{3\pi}{4} \)
Range: \([-1, 1]\]

Domain: All reals

\( f(x) = \cos x \)

Range: \([-1, 1]\]

Domain: All reals

\( f(x) = \sin x \)

You should know the graphs of

Quadrant Angles (\( \ldots, -\pi, -\frac{\pi}{2}, 0, \frac{\pi}{2}, \pi, \ldots \))
Domain: all reals

Range: \( \frac{2}{k} \pi \) for any integer \( k \), where \( k \) is an integer

\( f(x) = \tan x \) as well

You should know the graph of
To evaluate at any angle (including quadrant angles), you can use Option (3): The unit circle.