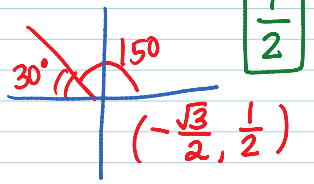
Warm-Up

Evaluate without a calculator:

① $\cos 45°$ ② $\sin \frac{5\pi}{6}$ ③ $\tan(-60°)$ ④ $\cos \pi$

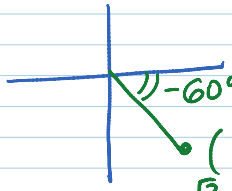
① $\frac{\sqrt{2}}{2}$

② $\frac{5\pi}{6} \times \frac{180}{\pi} = 150°$



$\frac{1}{2}$

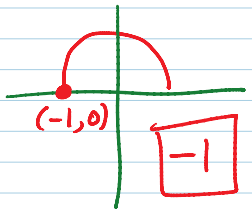
③



$\frac{\sin}{\cos} = \frac{-\frac{\sqrt{3}}{2}}{\frac{1}{2}} = -\frac{\sqrt{3}}{2} \cdot \frac{2}{1}$

$= -\sqrt{3}$

④



13.4: Evaluate Inverse Trig Functions

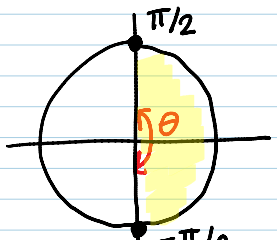
In 13.3, we were given an angle & asked to evaluate the value of a trig function. Now in 13.4, we'll be given the value of a trig function & will be asked to find the angle.

So for example, find an angle whose $\sin = \frac{1}{2}$.

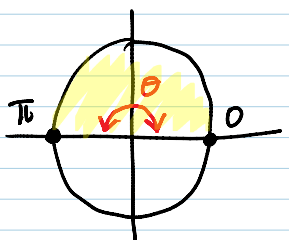
$30°, 150°, 390°, -330°$

To make things easier, we restrict the domain so we only have one unique angle.

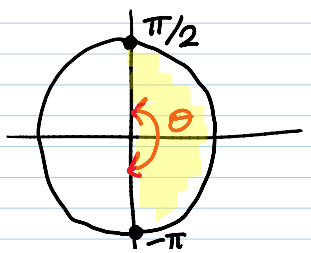
Inverse Sine



Inverse Cosine

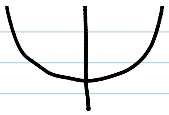


Inverse tangent



$-\frac{\pi}{2} < \theta < \frac{\pi}{2}$

$-90° < \theta < 90°$



$0 < \theta < \pi$

$0 < \theta < 180°$

$-\frac{\pi}{2} < \theta < \frac{\pi}{2}$

$-90° < \theta < 90°$

Evaluate the expression in both radians & degrees.

a) $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$

$\cos\theta = \frac{\sqrt{3}}{2}$

$30°$ or $\frac{\pi}{6}$

b) $\sin^{-1}(2)$

$\sin\theta = 2$

undefined

c) $\tan^{-1}(-\sqrt{3})$

$\tan\theta = -\sqrt{3}$

$-60°$ or $-\frac{\pi}{3}$

d) $\sin^{-1}(-1)$

$\sin\theta = -1$

$-90°$ or $-\frac{\pi}{2}$

e) $\cos^{-1}\left(-\frac{\sqrt{2}}{2}\right)$

$\cos\theta = -\frac{\sqrt{2}}{2}$

$\theta = 135°$ or $\frac{3\pi}{4}$

f) $\tan^{-1}\left(\frac{\sqrt{3}}{3}\right)$

$\tan\theta = \frac{\sqrt{3}}{3}$

$\theta = 30°$ or $\frac{\pi}{6}$

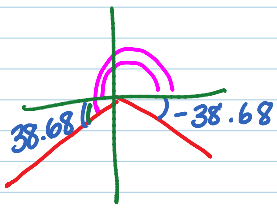
Take it a step further! Now solve over a given interval.

① Solve $\sin\theta = -\frac{5}{8}$ where $180° < \theta < 270°$

Step 1: use your calculator to find the ∡

$\theta = -38.68°$

Step 2: find the indicated quadrant



$180 + 38.68 = 218.68°$

CHECK: $\sin(218.68) = -\frac{5}{8}$

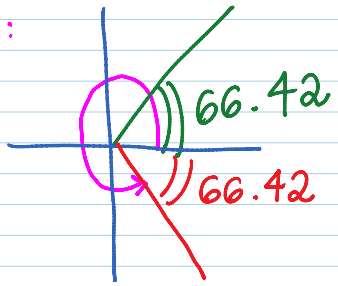
Solve for θ over the given interval:

② $\cos\theta = 0.4$; $270° < \theta < 360°$

4th Quad

Step 1: $\cos^{-1}(0.4) = 66.42$

Step 2:



$360 - 66.42 = 293.58°$

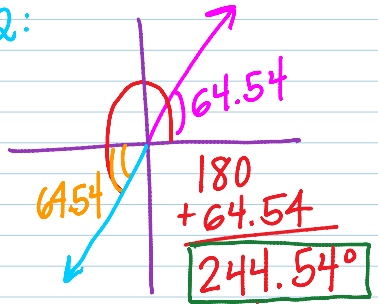
CHECK! $\cos(293.53) = .4$ ✓

③ $\tan\theta = 2.1$, $180° < \theta < 270°$

3rd Quad

Step 1: $\tan^{-1}(2.1) \approx 64.54$

Step 2:



$180 + 64.54 = 244.54°$

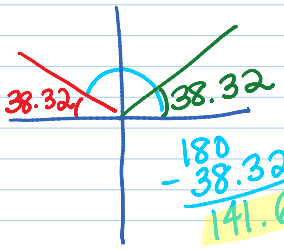
CHECK! $\tan(244.54) = 2.1$

④ $\sin\theta = 0.62$; $90° < \theta < 180°$

2nd Quad

Step 1: $\sin^{-1}(0.62) \approx 38.32$

Step 2:



$180 - 38.32 = 141.68°$

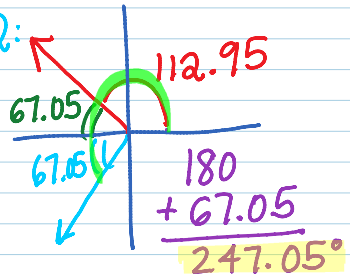
CHECK! $\sin(141.68) = .62$ ✓

⑤ $\cos\theta = -0.39$, $180° < \theta < 270°$

3rd Quad

Step 1: $\cos^{-1}(-.39) \approx 112.94$

Step 2:



$180 + 67.05 = 247.05°$

CHECK! $\cos(247.05) = -.39$ ✓