UNIVERSITY OF CALGARY

Lecture 2.2: Inverse Trigonometric Functions

University of Calgary

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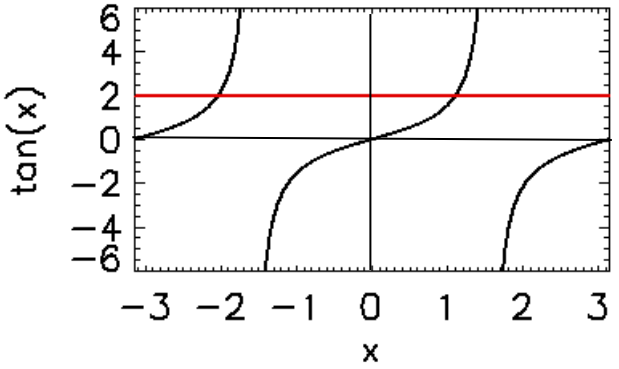
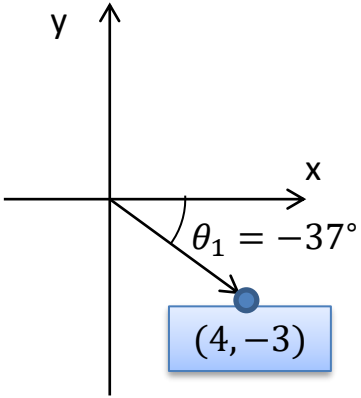


tan(θ)

- Multiple angles θ have the same value of $\tan(\theta)$



In both of these cases:

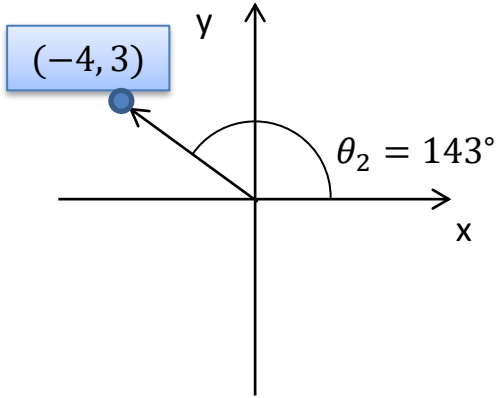
$$\tan(\theta) = \frac{y}{x} = -\frac{3}{4}$$

so

$$\tan(\theta_1) = \tan(\theta_2)$$

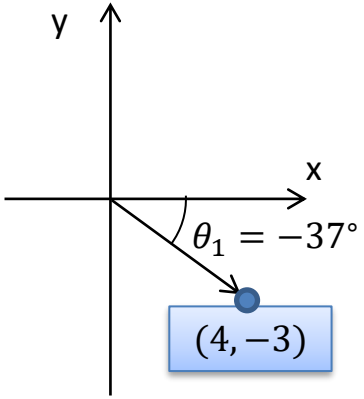
but

$$\theta_1 \neq \theta_2$$



- If $\tan(\theta) = x$ then $\tan(\theta + n\pi) = x$ for integer n.

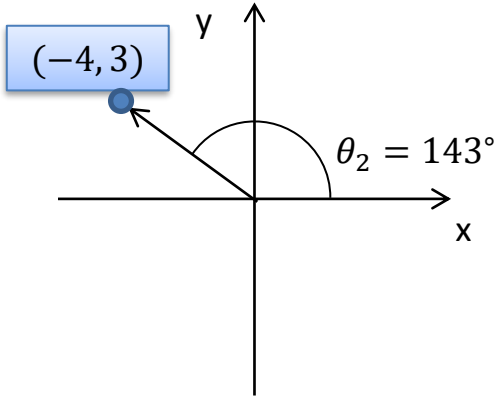
Inverse tangent: a warning



Calculator says:

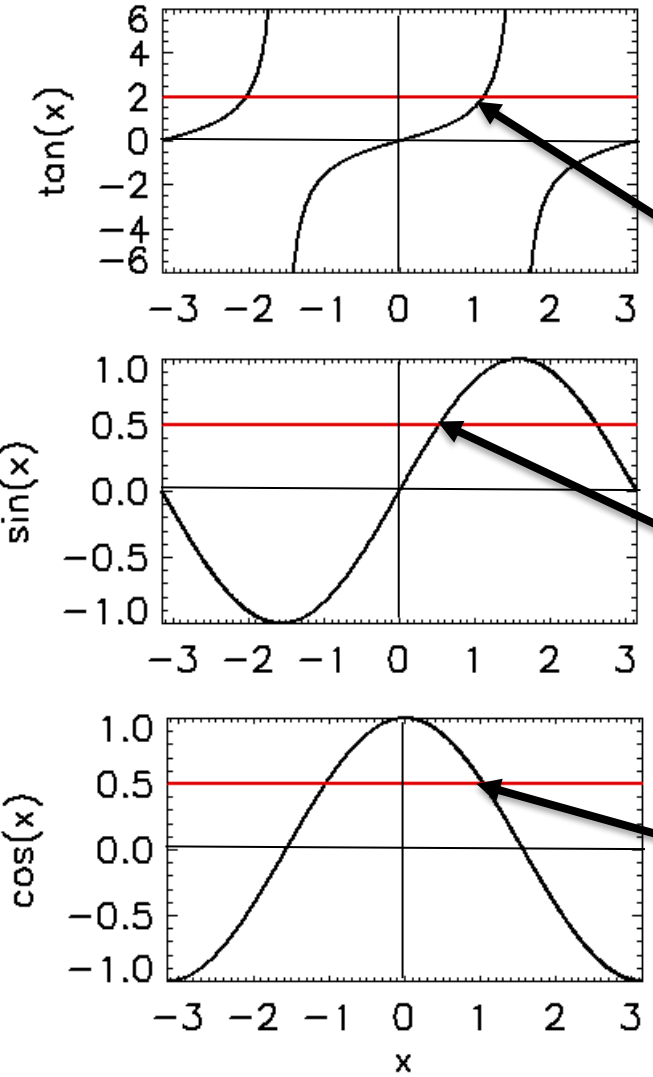
$$\tan^{-1}\left(-\frac{3}{4}\right) = -37°$$

But that's not right for θ_2!



HINT: If in doubt, sketch it out.

- Your calculator will always return $\tan^{-1} x$ in the range $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ [in degrees: $(-90°, 90°)$].
  - This will be right about half the time.
- If necessary, add/subtract π $(180°)$



All inverse trig functions are multi-valued.

$$\tan^{-1}(x) = \{\theta, \theta - \pi\} + 2\pi n$$

$$\sin^{-1}(x) = \{\theta, \pi - \theta\} + 2\pi n$$

$$\cos^{-1}(x) = \{\theta, -\theta\} + 2\pi n$$