1. When \( f(x) = \cos x \) is restricted to the domain \([0, \pi]\) it is one-to-one and it’s inverse is the **arccosine** function, denoted \( \cos^{-1} \) or \( \text{arccos} \). Let \( y = \cos^{-1}(x) \). Our goal is to find \( y' \).

   a) Implicitly differentiate \( \cos y = x \).

   b) The Pythagorean theorem shows that \( \sin y = \pm \sqrt{1 - \cos^2 y} \). Use information about the domain and range of \( \cos^{-1} \) to determine which square root is correct and substitute that value into the answer from part a.

   c) Substitute \( x = \cos y \) into the answer from part b to find \( y' \).

2. The **arctangent** function is the inverse of \( f(x) = \tan x \) on domain \((-\frac{\pi}{2}, \frac{\pi}{2})\). Repeat the steps of problem 1 to find \( \frac{d}{dx}(\tan^{-1} x) \). The relevant version of the Pythagorean theorem is \( \sec^2 y = 1 + \tan^2 y \).
3. Use triangles as needed to evaluate the following.

a) $\cos(\tan^{-1}(4))$

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

c) $\sin(\tan^{-1}(-2))$