NAMES:

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 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 asnwer from part b to find y'.

2. The **arctangent** function is the inverse of $f(x) = \tan x$ on domain $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$. Repeat the steps of problem 1 to find $\frac{\mathrm{d}}{\mathrm{d}x}(\tan^{-1} x)$. 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) $\sin(\tan^{-1}(-2))$