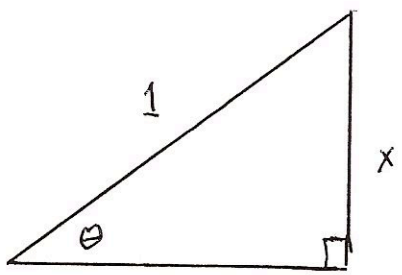
WORKSHEET 7 MATH 1300 February 28, 2008

**Goal:** To find the derivatives of the inverse trig functions.

**1.** Explain why the function $f(x) = \sin(x)$ does not have an inverse function unless we restrict its domain.

**2.** Explain why the function $f(x) = \sin(x)$ does have an inverse function if we restrict its domain to the interval $[-\frac{\pi}{2}, \frac{\pi}{2}]$. (The sine function with this restricted domain is sometimes denoted by $Sin(x)$.

**3.** Relationships involving trig and inverse trig functions can sometimes be simplified using elementary *triangle trigonometry*. For example, if we let $\theta = \sin^{-1}(x) = \sin^{-1}(\frac{x}{1})$, with $0 < x < 1$ then we have the triangle:




Use the above triangle to find $\cos(\sin^{-1}(x))$.

**4.** Find $\frac{d}{dx}sin^{-1}(x)$ by differentiating the relationship

$$\sin(\sin^{-1}(x)) = x,$$

and use the relationship you found in (3) to express $\frac{d}{dx}sin^{-1}(x)$ without using any trig functions.

**5.** Do we have to change what we did above to find $\frac{d}{dx}sin^{-1}(x)$ for negative values of $x$, that is for $x$ with $-1 < x < 0$.

**6.** The function $f(x) = \tan(x)$ has an inverse function if we restrict its domain to the interval $(-\frac{\pi}{2}, \frac{\pi}{2})$. (Why?) Use the method outlined above to find the derivative of $\tan^{-1}(x)$. (Be careful to describe the domain and range of this function.)