Assignment 8C: Inverse Trig Functions

State the range of the inverse function and find the value of the expression on that range. Support your answer by sketching a unit circle and the appropriate angle.

1. $\sin^{-1}\left(-\frac{1}{2}\right) = -\frac{\pi}{6}$

2. $\cos^{-1}\left(\frac{\sqrt{2}}{2}\right) = \frac{\pi}{4}$

3. $\tan^{-1}(-\sqrt{3}) = -\frac{\pi}{3}$

Find the following values. Support your answer with a reference triangle or unit circle drawing.

4. $\arctan\left(\cos\left(\frac{\pi}{3}\right)\right) = \arctan\frac{1}{2} \approx \mathbf{.46\ radians}$

5. $\tan\left(\sin^{-1}\left(\frac{5}{6}\right)\right) = \mathbf{\frac{5\sqrt{11}}{11}}$

$$Opp = 5, hyp = 6,$$
$$5^2 + b^2 = 6^2$$
$$b = 5\sqrt{11}$$

6. $\sin(\arctan(x)) = \frac{x}{\sqrt{x^2+1}}$

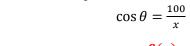   (State your answer in terms of x)

$$let\ \theta = \arctan(x)$$
$$\tan(\theta) = \frac{x}{1}$$
$$opp = x, \qquad adj = 1$$
$$x^2 + 1^2 = c^2$$
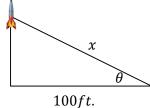$$hyp = c = \sqrt{x^2 + 1}$$

7. $\csc\left(\tan^{-1}\left(\frac{2}{x}\right)\right) = \frac{\sqrt{4+x^2}}{x}$

    (State your answer in terms of x)

$$let\ \theta = \arctan\left(\frac{2}{x}\right), \quad \tan(\theta) = \frac{2}{x}$$
$$opp = 2, \qquad adj = x$$
$$x^2 + 2^2 = c^2$$
$$hyp = c = \sqrt{x^2 + 4}$$

8. Matt and Brad are watching a rocket that they shot vertically into the air. They measure the angle of elevation, θ, from where the rocket was launched. If the launch pad is 100ft. away from the boys, write an equation that relates θ to the shortest distance, x, from the boys to the rocket.

$$\cos \theta = \frac{100}{x}$$

$$\theta(x) = \cos^{-1}\left(\frac{100}{x}\right)$$

x

θ

$100ft.$