1. Find dy/dx if $y = \arcsin(3x)$.

$$\frac{d}{dx} \arcsin(3x) = \frac{1}{\sqrt{1-(3x)^2}} \cdot 3$$

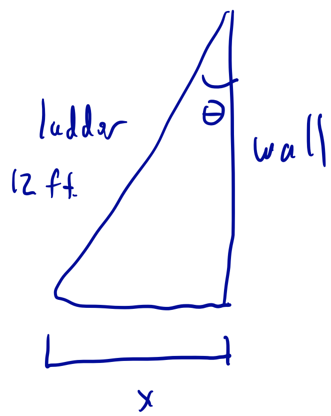
2. Find dy/dx if $y = \arctan\left(\sqrt{4-x^2}\right)$.

$$\frac{d}{dx} \arctan\left(\sqrt{4-x^2}\right) = \frac{1}{1+\left(\sqrt{4-x^2}\right)^2} \cdot \frac{d}{dx}\sqrt{4-x^2}$$

$$= \frac{1}{1+4-x^2} \cdot \frac{1}{2\sqrt{4-x^2}} \cdot (-2x)$$

$$= \frac{-x}{(5-x^2)\sqrt{4-x^2}}$$

3. A 12-foot ladder is leaning against a wall. Let x denote the distance of the base of the ladder from the wall, and let θ be the angle between the ladder and the wall. How fast does the angle θ change with respect to x?



$$\sin\theta = \frac{x}{12}$$

$$\theta = \arcsin\left(\frac{x}{12}\right)$$

$$\frac{d\theta}{dx} = \frac{1}{\sqrt{1-\left(\frac{x}{12}\right)^2}} \cdot \frac{1}{12} = \frac{1}{\sqrt{12^2 - x^2}}$$

4. I compute that $d\theta/dx \approx 0.1$ when $x = 7$. What does this mean in language your parents can understand? Feel free to express your answer in terms of degrees instead of radians.

When the base of the ladder is 7 feet from the wall, as the base is moved away from the wall, the angle between the ladder and the wall increases at a rate of 0.1 radians per foot, which is about 6° per foot.