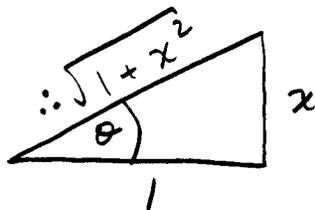


(1)[5 points] Simplify

$$\sin(\tan^{-1}(x))$$

$$\text{Let } \theta = \tan^{-1}(x)$$

$$\therefore \tan(\theta) = \frac{x}{1}$$



$$\therefore \sin(\tan^{-1}(x))$$

$$= \sin(\theta)$$

$$= \frac{x}{\sqrt{1+x^2}}$$

(2)[5 points] Find the derivative of

$$H(x) = (1+x^2) \arctan(x)$$

$$H'(x) = 2x \cdot \arctan(x) + \cancel{(1+x^2)} \frac{1}{\cancel{(1+x^2)}}$$

$$= 2x \cdot \arctan(x) + 1$$

(3)[5 points] Find $g'(2)$ where

$$g(x) = x \sin^{-1}(x/4) + \sqrt{16 - x^2}$$

$$g'(x) = \sin^{-1}\left(\frac{x}{4}\right) + x \frac{1}{\sqrt{1 - \left(\frac{x}{4}\right)^2}} \cdot \frac{1}{4} + \frac{1}{2} (16 - x^2)^{-\frac{1}{2}} (-2x)$$

$$g'(2) = \sin^{-1}\left(\frac{2}{4}\right) + \frac{2}{\sqrt{1 - \left(\frac{2}{4}\right)^2}} \cdot \frac{1}{4} - 2 (16 - 2^2)^{-\frac{1}{2}}$$

$$= \sin^{-1}\left(\frac{1}{2}\right) + \frac{1}{2} \frac{2}{\sqrt{3}} - \frac{2}{2\sqrt{3}}$$

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

$$= \frac{\pi}{6}$$

