Name: **Richard**

1. Find the derivatives of the following functions.

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

$$\frac{dy}{dx} = \boxed{\frac{1}{\sqrt{1-x^2}}}$$

(b) $y = \sin^{-1}(\sqrt{2}\,x)$

$$\frac{dy}{dx} = \frac{1}{\sqrt{1-(\sqrt{2}x)^2}} \cdot \frac{d}{dx}\left[\sqrt{2}\,x\right] = \boxed{\frac{\sqrt{2}}{\sqrt{1-2x^2}}}$$

(c) $f(x) = \ln\left(x^2 + \frac{1}{x}\right)$

$$f'(x) = \frac{1}{x^2 + \frac{1}{x}} \cdot \frac{d}{dx}\left[x^2 + \frac{1}{x}\right] = \boxed{\frac{2x - \frac{1}{x^2}}{x^2 + \frac{1}{x}}}$$

(d) $z = \frac{\ln(w)}{w}$

$$\frac{dz}{dw} = \frac{\frac{d}{dw}\left[\ln(w)\right]w - \ln(w)\frac{d}{dw}\left[w\right]}{w^2} = \frac{\frac{1}{w}w - \ln(w)}{w^2}$$

$$= \boxed{\frac{1-\ln(w)}{w^2}}$$

Name: **Richard**

1. Find the derivatives of the following functions.

(a) $y = \tan^{-1}(x)$

$$\frac{dy}{dx} = \boxed{\frac{1}{1+x^2}}$$

(b) $y = \ln(\tan^{-1}(x))$

$$\frac{dy}{dx} = \frac{1}{\tan^{-1}(x)} \cdot \frac{d}{dx}\left[\tan^{-1}(x)\right] = \boxed{\frac{1}{\tan^{-1}(x)(1+x^2)}}$$

(c) $f(x) = \frac{1}{x^2 + \ln(x)}$

$$f'(x) = \frac{0(x^2 + \ln(x)) - (2x + \frac{1}{x})}{(x^2 + \ln(x))^2} = \boxed{\frac{-2x - \frac{1}{x}}{(x^2 + \ln(x))^2}}$$

(d) $z = w\ln(w)$

$$\frac{dz}{dw} = (1)\ln(w) + w\frac{1}{w}$$

$$= \boxed{\ln(w) + 1}$$