5A1. Inverse trigonometric functions; Hyperbolic functions

1a)

$\arctan(\sqrt{3}) = 1.047$

1b)

$\arcsin\left(\frac{\sqrt{3}}{2}\right) = 1.047$

1c)

$\arctan(5) = 1.373 \text{ rad}$

$\sin 1.373 = 0.981$

$\cos 1.373 = 0.197$

$\sec 1.373 = \frac{1}{\cos 1.373} = 5.089$

3f)

$$\frac{d}{dx}\arcsin\left(\frac{a}{x}\right) = \frac{\frac{d}{dx}\left(\frac{a}{x}\right)}{\left(1-\left(\frac{a}{x}\right)^2\right)^{1/2}} = \frac{-\frac{a}{x^2}}{\left(1-\left(\frac{a}{x}\right)^2\right)^{1/2}} = \boxed{-\frac{a}{x^2\left(1-\left(\frac{a}{x}\right)^2\right)^{1/2}}}$$

3g)

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

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

$$= (1-x^2)^{1/2} + x^2(1-x^2)^{-1/2} = \boxed{\frac{1}{(1-x^2)^{1/2}}}$$

3h)

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

$$= \boxed{\frac{-1}{2(x-x^2)^{1/2}}}$$