

$$\begin{aligned}
 1.a \quad \cos(-\theta) &= \cos(0-\theta) \\
 &= \cos(0)\cos\theta + \sin(0)\sin\theta \\
 &= (1)\cos\theta + (0)\sin\theta \\
 &= \cos\theta
 \end{aligned}$$

$$\begin{aligned}
 b. \quad \sin\left(\frac{\pi}{2}-\theta\right) &= \sin\left(\frac{\pi}{2}\right)\cos\theta - \cos\left(\frac{\pi}{2}\right)\sin\theta \\
 &= (1)\cos\theta - (0)\sin\theta \\
 &= \cos\theta
 \end{aligned}$$

$$\begin{aligned}
 c. \quad \cos\left(\frac{\pi}{2}-\theta\right) &= \cos\left(\frac{\pi}{2}\right)\cos\theta + \sin\left(\frac{\pi}{2}\right)\sin\theta \\
 &= (0)\cos\theta + (1)\sin\theta \\
 &= \sin\theta
 \end{aligned}$$

$$\begin{aligned}
 d. \quad \tan(\pi+\theta) &= \frac{\tan\pi + \tan\theta}{1 - \tan\pi \tan\theta} \\
 &= \frac{0 + \tan\theta}{1 - (0)\tan\theta} = \tan\theta
 \end{aligned}$$

$$\begin{aligned}
 e. \quad \sin(\theta+\theta) &= \sin\theta \cos\theta + \cos\theta \sin\theta \\
 &= 2\sin\theta \cos\theta
 \end{aligned}$$

$$\begin{aligned}
 f. \quad \cos(\theta+\theta) &= \cos\theta \cos\theta - \sin\theta \sin\theta \\
 &= \cos^2\theta - \sin^2\theta
 \end{aligned}$$

$$\begin{aligned}
 g. \quad \tan(\theta+\theta) &= \frac{\tan\theta + \tan\theta}{1 - \tan\theta \tan\theta} \\
 &= \frac{2\tan\theta}{1 - \tan^2\theta}
 \end{aligned}$$

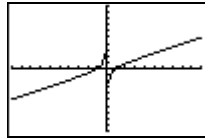
$$\begin{aligned}
 h. \quad \sin(\theta+\pi) &= \sin\theta \cos\pi + \cos\theta \sin\pi \\
 &= (\sin\theta)(-1) + (\cos\theta)(0) \\
 &= -\sin\theta
 \end{aligned}$$

$$\begin{aligned}
 i. \quad \cos(\theta-\pi) &= \cos\theta \cos\pi + \sin\theta \sin\pi \\
 &= (\cos\theta)(-1) + (\sin\theta)(0) \\
 &= -\cos\theta
 \end{aligned}$$

$$\begin{aligned}
 j. \quad \sin\left(\frac{\pi}{4}+\theta\right) + \cos\left(\frac{\pi}{4}+\theta\right) &= \left[ \sin\left(\frac{\pi}{4}\right)\cos\theta + \cos\left(\frac{\pi}{4}\right)\sin\theta \right] + \left[ \cos\left(\frac{\pi}{4}\right)\cos\theta - \sin\left(\frac{\pi}{4}\right)\sin\theta \right] \\
 &= \left[ \frac{\sqrt{2}}{2}\cos\theta + \frac{\sqrt{2}}{2}\sin\theta \right] + \left[ \frac{\sqrt{2}}{2}\cos\theta - \frac{\sqrt{2}}{2}\sin\theta \right] \\
 &= \frac{\sqrt{2}}{2}\cos\theta + \frac{\sqrt{2}}{2}\cos\theta \\
 &= \sqrt{2}\cos\theta
 \end{aligned}$$

$$\begin{aligned}
 2a. \quad \tan(\arctan x - \arctan x^{-1}) &= \frac{\tan \alpha - \tan \beta}{1 + \tan \alpha \tan \beta} \\
 &= \frac{x - \frac{1}{x}}{1 + x \cdot \frac{1}{x}} \\
 &= \frac{x - \frac{1}{x}}{1+1} \cdot \frac{x}{x} = \frac{x^2 - 1}{2x}
 \end{aligned}$$

$$\sqrt{Y_1} \ominus \tan(\tan^{-1}(X) - \tan^{-1}(X^{-1}))$$

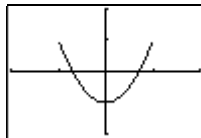


Let  $\alpha = \arctan x$  and  $\beta = \arctan x^{-1}$

Then  $\tan \alpha = x$  and  $\tan \beta = x^{-1} = \frac{1}{x}$

$$\begin{aligned}
 b. \quad \sin(\arcsin x - \arccos x) &= \sin(\alpha - \beta) \\
 &= \sin \alpha \cos \beta - \cos \alpha \sin \beta \\
 &= (x)(x) - (\sqrt{1-x^2})(\sqrt{1-x^2}) \\
 &= x^2 - (1-x^2) \\
 &= x^2 - 1 + x^2 = 2x^2 - 1
 \end{aligned}$$

$$\sqrt{Y_1} \ominus \sin(\sin^{-1}(X) - \cos^{-1}(X))$$



Let  $\alpha = \arcsin x$  and  $\beta = \arccos x$

Then  $\sin \alpha = x$  and  $\cos \beta = x$

$$\cos \alpha = \sqrt{1-x^2} \quad \text{and} \quad \sin \beta = \sqrt{1-x^2}$$

$$\text{Note: } \cos \alpha = \sqrt{1-\sin^2 \alpha}$$

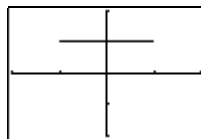
$$= \sqrt{1-x^2}$$

$$\sin \beta = \sqrt{1-\cos^2 \beta}$$

$$= \sqrt{1-x^2}$$

$$\begin{aligned}
 c. \quad \cos(\arcsin x + \arccos x) &= \cos(\alpha + \beta) \\
 &= \cos \alpha \cos \beta - \sin \alpha \sin \beta \\
 &= (\sqrt{1-x^2})(x) - (x)(\sqrt{1-x^2}) \\
 &= 0
 \end{aligned}$$

$$\sqrt{Y_1} \ominus 1 + \cos(\sin^{-1}(X) + \cos^{-1}(X))$$



Let  $\alpha = \arcsin x$  and  $\beta = \arccos x$

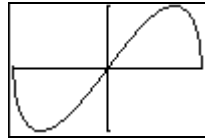
Then  $\sin \alpha = x$  and  $\cos \beta = x$

$$\cos \alpha = \sqrt{1-x^2} \quad \text{and} \quad \sin \beta = \sqrt{1-x^2}$$

$$\begin{aligned}
 \text{d. } \cos(\arcsin x - \arccos x) &= \cos(\alpha - \beta) \\
 &= \cos \alpha \cos \beta + \sin \alpha \sin \beta \\
 &= (\sqrt{1-x^2})(x) + (x)(\sqrt{1-x^2}) \\
 &= 2x\sqrt{1-x^2}
 \end{aligned}$$

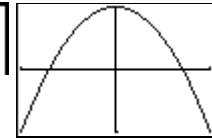
Let  $\alpha = \arcsin x$  and  $\beta = \arccos x$   
 Then  $\sin \alpha = x$  and  $\cos \beta = x$   
 $\cos \alpha = \sqrt{1-x^2}$  and  $\sin \beta = \sqrt{1-x^2}$

$$\sqrt{1-x^2} \cos(\sin^{-1}(x) - \cos^{-1}(x))$$



e.  $(\arccos x - \arcsin x)$  and  $(\arcsin x - \arccos x)$  are opposites.  
 Since  $\sin(\theta) = -\sin(-\theta)$ ,  
 $\sin(\alpha - \beta) = -\sin(\beta - \alpha)$

$$\sqrt{1-x^2} \sin(\cos^{-1}(x) - \sin^{-1}(x))$$

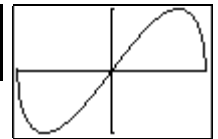


$$\sin(\arccos x - \arcsin x) = 1 - 2x^2$$

The graphs of (b) and (e) are vertical reflections of each other since they generate opposite outputs.

f. Since  $\cos(-\theta) = \cos(\theta)$ ,  $\cos(\alpha - \beta) = \cos(\beta - \alpha)$   
 $\cos(\arccos x - \arcsin x) = 2x\sqrt{1-x^2}$

$$\sqrt{1-x^2} \cos(\cos^{-1}(x) - \sin^{-1}(x))$$



g. Graphing this expression would result in an error since it is undefined for all real numbers.

$$\begin{aligned}
 \tan(\arctan x + \arctan x^{-1}) &= \frac{\tan \alpha + \tan \beta}{1 - \tan \alpha \tan \beta} \\
 &= \frac{x + \frac{1}{x}}{1 - x \cdot \frac{1}{x}} \\
 &= \frac{x + \frac{1}{x}}{1 - 1} \\
 &= \frac{x + \frac{1}{x}}{0} \text{ which is undefined.}
 \end{aligned}$$

Let  $\alpha = \arctan x$  and  $\beta = \arctan x^{-1}$

Then  $\tan \alpha = x$  and  $\tan \beta = x^{-1} = \frac{1}{x}$