

1. Use the sum and difference identities to show the following facts, some old, some new.

Example: $\sin(-\theta) = -\sin\theta$

Answer: $\sin(-\theta) = \sin(0-\theta) = \sin 0 \cos\theta - \cos 0 \sin\theta = 0 \cdot \cos\theta - 1 \cdot \sin\theta = -\sin\theta$

a. $\cos(-\theta) = \cos\theta$

b. $\sin\left(\frac{\pi}{2} - \theta\right) = \cos\theta$

c. $\cos\left(\frac{\pi}{2} - \theta\right) = \sin\theta$

d. $\tan(\pi + \theta) = \tan\theta$

e. $\sin 2\theta = 2 \sin\theta \cos\theta$
Hint: $\sin 2\theta = \sin(\theta + \theta)$

f. $\cos 2\theta = \cos^2\theta - \sin^2\theta$

g. $\tan 2\theta = \frac{2 \tan\theta}{1 - \tan^2\theta}$

h. $\sin(\theta + \pi) = -\sin\theta$

i. $\cos(\theta - \pi) = -\cos\theta$

j. $\sin\left(\frac{\pi}{4} + \theta\right) + \cos\left(\frac{\pi}{4} + \theta\right) = \sqrt{2} \cos\theta$

Find Algebraic Expressions

2. Write as algebraic expressions in x . Use a grapher to verify in the specified window.

a. $\tan(\arctan x - \arctan x^{-1})$ in the standard window.

b. $\sin(\arcsin x - \arccos x)$ in $[-2, 2]$ by $[-2, 2]$

c. $\cos(\arcsin x + \arccos x)$ in $[-2, 2]$ by $[-2, 2]$

Hint: Graph the function $y = 1 + \cos(\arcsin x + \arccos x)$

d. $\cos(\arcsin x - \arccos x)$ in $[-1, 1]$ by $[-1, 1]$

e. $\sin(\arccos x - \arcsin x)$ in $[-1, 1]$ by $[-1, 1]$

What can you say about the graphs of (b) and (e)? Why would you expect this?

f. $\cos(\arccos x - \arcsin x)$

Hint: Use (d)

g. What can you expect if you graph $y = \tan(\arctan x + \arctan x^{-1})$ in the standard window? Why?