

5.1 Co-function Identities Worksheet

This document was composed and formatted by Annie Bernatchez.

The course material originated from www.jensenmath.ca

1) Simplify.

a) $\sin x \left(\frac{1}{\cos x} \right)$	b) $(\cos x)(\sec x)$
c) $1 - \cos^2 x$	d) $1 - \sin^2 x$
e) $\frac{\tan x}{\sin x}$	f) $(1 - \sin x)(1 + \sin x)$
g) $\left(\frac{1}{\tan x} \right) \sin x$	h) $\frac{1 + \tan^2 x}{\tan^2 x}$
i) $\frac{\sin x \cos x}{1 - \sin^2 x}$	j) $\frac{1 - \cos^2 x}{\sin x \cos x}$

2) Prove the following identities.

a) $\sin^2 x(1 + \cot^2 x) = 1$

b) $1 - \cos^2 x = \tan x \cos x \sin x$

c) $\cos x \tan^3 x = \sin x \tan^2 x$

d) $1 - 2\cos^2\theta = \sin^4\theta - \cos^4\theta$

e) $\cot x + \frac{\sin x}{1 + \cos x} = \csc x$

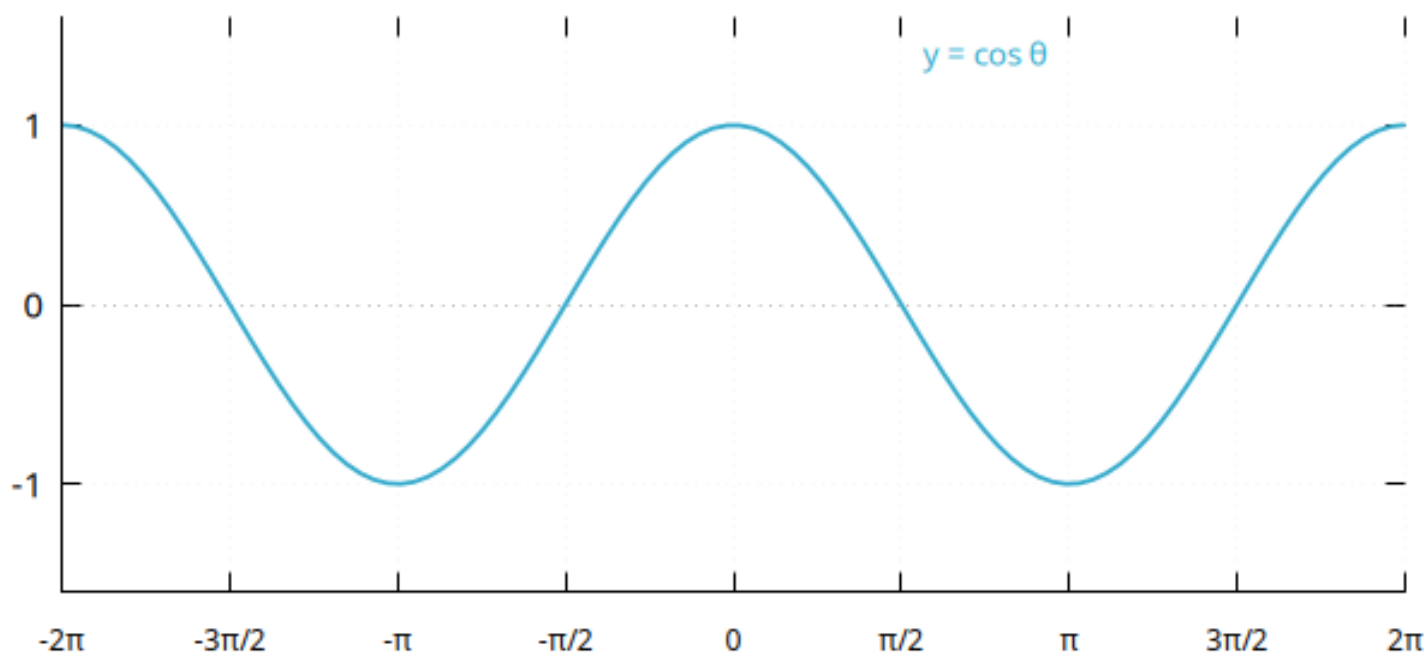
f) $\frac{\sec x}{\sin x} + \frac{\csc x}{\cos x} = \frac{2}{\sin x \cos x}$

g) $\frac{\cos^2 x - \sin^2 x}{\cos^2 x + \sin x \cos x} = 1 - \tan x$

h) $\frac{1}{1 + \cos x} + \frac{1}{1 - \cos x} = 2\csc^2 x$

3)

a) Use transformations and the cosine function to write three equivalent expressions for the following graph:



b) Transform your 3 equations from part a) to write the equation of 3 sine functions that represent the graph.

4) Use the co-function identities to write an expression that is equivalent to each of the following expressions.

a) $\sin \frac{\pi}{6}$	b) $\cos \frac{5\pi}{12}$	c) $\cos \frac{5\pi}{16}$
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5) Write an expression that is equivalent to each of the following expressions, using the related acute angle.

a) $\sin \frac{7\pi}{8}$	b) $\cos \frac{13\pi}{12}$	c) $\cos \frac{11\pi}{6}$
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6) Given that $\sin \frac{\pi}{6} = \frac{1}{2}$, use an equivalent trigonometric expression to show that $\cos \frac{\pi}{3} = \frac{1}{2}$

7) Given that $\sin \frac{\pi}{6} = \frac{1}{2}$, use an equivalent trigonometric expression to show that $\cos \frac{2\pi}{3} = -\frac{1}{2}$

8) Given that $\csc \frac{\pi}{4} = \sqrt{2}$, use an equivalent trigonometric expression to show that $\sec \frac{3\pi}{4} = -\sqrt{2}$

9) Given that $\cos \frac{3\pi}{11} \approx 0.6549$, use equivalent trigonometric expressions to evaluate the following, to four decimal places.

a) $\sin \frac{5\pi}{22}$	b) $\sin \frac{17\pi}{22}$
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Answer Key

1) a) $\tan x$ b) 1 c) $\sin^2 x$ d) $\cos^2 x$ e) $\sec x$ f) $\cos^2 x$ g) $\cos x$ h) $\csc^2 x$ i) $\tan x$ j) $\tan x$

3) Answers will vary depending but possible solutions are:

a) $y = \cos(\theta + 2\pi)$, $y = \cos(\theta - 2\pi)$, $y = \cos(\theta - 4\pi)$

b) $y = \sin\left(\theta + \frac{5\pi}{2}\right)$, $y = \sin\left(\theta - \frac{3\pi}{2}\right)$, $y = \sin\left(\theta - \frac{7\pi}{2}\right)$

4) a) $\cos \frac{\pi}{3}$ b) $\sin \frac{\pi}{12}$ c) $\sin \frac{3\pi}{16}$

5) a) $\sin \frac{\pi}{8}$ b) $-\cos \frac{\pi}{12}$ c) $\cos \frac{\pi}{6}$

9) a) $\sin \frac{5\pi}{22} = \cos \frac{3\pi}{11} \approx 0.6549$ b) $\sin \frac{17\pi}{22} = \cos\left(-\frac{3\pi}{11}\right) = \cos \frac{3\pi}{11} \approx 0.6549$