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

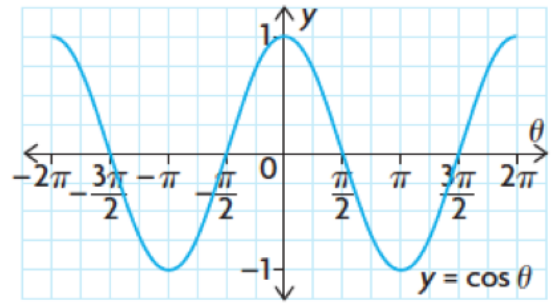**d)** $1 - 2\cos^2 \theta = \sin^4 \theta - \cos^4 \theta$

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

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

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

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

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) $\sin \dfrac{\pi}{6}$

b) $\cos \dfrac{5\pi}{12}$

c) $\cos \dfrac{5\pi}{16}$

5) Write an expression that is equivalent to each of the following expressions, using the related acute angle.

a) $\sin \dfrac{7\pi}{8}$

b) $\cos \dfrac{13\pi}{12}$

c) $\cos \dfrac{11\pi}{6}$

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 $\cos\frac{3\pi}{11} \sim 0.6549$, use equivalent trigonometric expressions to evaluate the following, to four decimal places.

a) $\sin\frac{5\pi}{22}$

b) $\sin\frac{17\pi}{22}$