http://myweb.nmu.edu/crseval

10. Verify the following identities

a) $\cos(x)(\sec(x) + 2\sin(x)) = 1 + \sin(2x)$

$\sec(x) = \frac{1}{\cos(x)}$

① distribute: $\cos(x) \cdot \left(\frac{1}{\cos(x)}\right) + 2\sin(x) \cdot \cos(x)$

② $1 + 2\sin(x)\cos(x) = 1 + \sin(2x)$

③ since $\sin(2x) = \sin(x+x) = \sin(x)\cos(x) + \sin(x)\cos(x) = 2\sin(x)\cos(x)$

b) $\dfrac{1-\cos(x)}{\sin(x)} + \dfrac{\sin(x)}{1-\cos(x)} = 2\csc(x)$

common denom.

$$\frac{1-\cos(x)}{1-\cos(x)} \cdot \frac{1-\cos(x)}{\sin(x)} + \frac{\sin(x)}{1-\cos(x)} \cdot \frac{\sin(x)}{\sin(x)}$$

$$\frac{[1-\cos(x)]^2 + \sin^2(x)}{(1-\cos(x))(\sin(x))} = \frac{1 - 2\cos(x) + \underbrace{\cos^2(x) + \sin^2(x)}_{=1}}{(1-\cos(x))\sin(x)}$$

$\to 2 - 2\cos x$

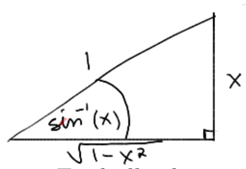
$$= \frac{2\cancel{(1-\cos(x))}}{\cancel{1-\cos(x)}\sin(x)} = 2 \cdot \left(\frac{1}{\sin(x)}\right) = 2 \cdot \csc(x)$$

11. Rewrite as an algebraic expression of x.

$$\cos(\sin^{-1}(x)) = \frac{adj}{hyp} = \frac{\sqrt{1-x^2}}{1} = \boxed{\sqrt{1-x^2}}$$

start here:

$\sin^{-1}(x)$ is an angle whose $\frac{\text{opposite side}}{\text{hypotenuse}} = \frac{x}{1}$

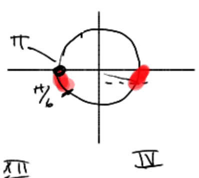


$1^2 = x^2 + y^2 =$

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

12. Find all solutions.

$\frac{4\pi}{6} = \frac{2\pi}{3}$



a) $2\sin(3\theta) + 1 = 0$

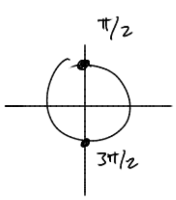
① $\sin(3\theta) = -\frac{1}{2}$ so $3\theta = -\frac{\pi}{6}$ or $3\theta = \frac{7\pi}{6}$

$\pi - \left(-\frac{\pi}{6}\right) = \frac{7\pi}{6}$

now add $2\pi k$ $\quad 3\theta = -\frac{\pi}{6} + 2\pi k$ or $3\theta = \frac{7\pi}{6} + 2\pi k$

$$\boxed{\theta = -\frac{\pi}{18} + \frac{2}{3}\pi k \quad \text{or} \quad \theta = \frac{7\pi}{18} + \frac{2}{3}\pi k}$$

b) $2\sin(\theta)\cos(\theta) - \cos(\theta) = 0$



$\cos(\theta)(2\sin(\theta) - 1) = 0$

$\cos\theta = 0$

$\theta = \frac{\pi}{2} + 2\pi k$

or

$\theta = \frac{3\pi}{2} + 2\pi k$

$\theta = \frac{(2k+1)\pi}{2} + 2\pi k$

$2\sin\theta - 1 = 0$

$2\sin\theta = 1$

$\sin\theta = \frac{1}{2}$

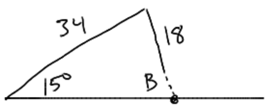
$\theta = \frac{\pi}{6} + 2\pi k$

$\theta = \pi - \frac{\pi}{6} = \frac{5\pi}{6}$

$\theta = \frac{5\pi}{6} + 2\pi k$

A S S $\Rightarrow$ check supplementary angle

13. Solve for all possible triangles: $A = 15°$, $a = 18$, $b = 34$



Law of Sines

$$\frac{\sin 15}{18} = \frac{\sin B}{34}$$

$$\sin^{-1}\left[\frac{34 \cdot \sin 15}{18}\right] = \boxed{B = 29.2°}$$

$$\boxed{C = 180 - 15 - 29.2 = 134.8°}$$

$$\frac{\sin 134.8}{c} = \frac{\sin 15}{18}$$

$$\boxed{c = \frac{18}{\sin 15} \cdot \sin 134.8 = 49.34}$$

$180 - 29.2 = 159.8°$

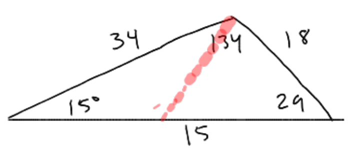
Since $159.8° + 15° < 180$ this is compatible this triangle exists.

$$\boxed{B = 159.8}$$

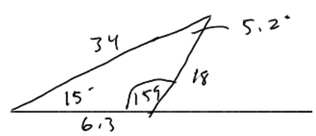
$$\boxed{C = 180 - 15 - 159.8 = 5.2°}$$

$$\frac{c}{\sin(5.2)} = \frac{18}{\sin(15)}$$

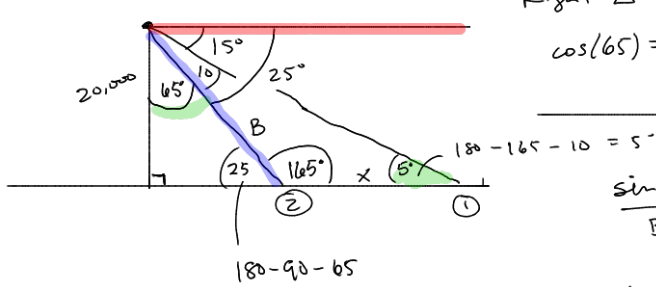
$$\boxed{c = \frac{18}{\sin(15)} \cdot \sin(5.2) = 6.3}$$



or



14. A pilot measures the angle of depression to two ships in the water in front of the plane as 15° and 25° respectively. If the pilot is flying at an altitude of 20,000 feet, find the distance between the two ships. Draw a picture.



Right Δ Trig.

$$\cos(65) = \frac{20{,}000}{B}, \quad B = \frac{20000}{\cos 65}$$

$$\frac{\sin(5)}{B} = \frac{\sin 10}{x}$$

$$x = \frac{B}{\sin(5)} \cdot \sin 10$$

$x = 94{,}287$

15. Match the equation to the graph (Each one has a place...)

a) $\cos(x)$

b) $-3\cos(x)$

c) $2\sin(-x)$

d) $\cos(3x) - 1$

e) $4\cos(2x)$

f) $4\cos(\frac{1}{2}x)$

g) $2\sin(x)$

h) $\cos(3x) + 1$

a) $\cos(x)$

b) $-3\cos(x)$

c) $2\sin(-x)$

d) $\cos(3x) - 1$

e) $4\cos(2x)$

f) $4\cos(\frac{1}{2}x)$

g) $2\sin(x)$

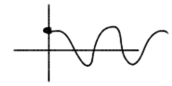
h) $\cos(3x) + 1$

$y = A\sin(k(x-p)) + V$

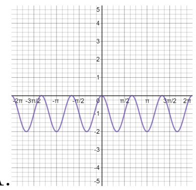
sin x

$|A|$ = amplitude k = frequency

$\frac{2\pi}{k}$ = period p = phase shift:

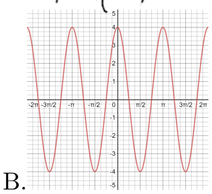


cos(x)



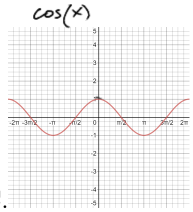
A.

$4\cos(2x)$



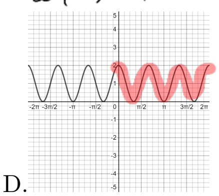
B.

$\cos(x)$



C.

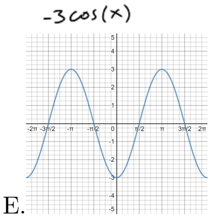
$\cos(3x) + 1$



D.

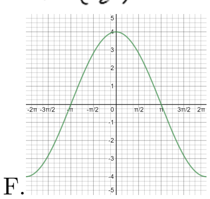
(graph is inverted)

$-3\cos(x)$



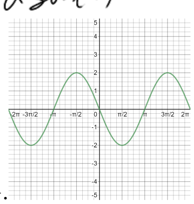
E.

$4\cos(\frac{1}{2}x)$



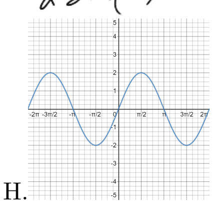
F.

$2\sin(-x)$



G.

$2\sin(x)$



H.