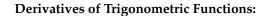
1. Using the fact that $\frac{d}{dx}[\sin x] = \cos x$ and the geometric relationship between $f(x) = \sin x$ and $g(x) = \cos x$, explain why

$$\frac{d}{dx}\left[\cos x\right] = -\sin x.$$

2. Show $\frac{d}{dx} [\tan x] = \sec^2 x$ using the Quotient Rule and the derivatives of sine and cosine.



- $\frac{d}{dx}(\sin x) =$ _____ $\frac{d}{dx}(\cos x) =$ _____ $\frac{d}{dx}(\tan x) =$ _____

- $\frac{d}{dx}(\csc x) =$ _____ $\frac{d}{dx}(\sec x) =$ _____ $\frac{d}{dx}(\cot x) =$ _____

- 3. Find the derivatives of each of the following:
 - (a) $y = e^x (\tan x \sec x)$

(b) $g(\theta) = \frac{\sin \theta}{\cos \theta + 1}$

4. For what values of *t* does the graph of $f(t) = t + 2\cos t$ have a horizontal tangent?

5. An elastic band is hung on a hook and a mass is hung on the lower end of the band. When the mass is pulled down 2 cm past its rest position and then released, it vibrates vertically. The equation of motion is

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s = 2\cos t + 3\sin t, \text{ for } t \ge 0,
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where s is measured in centimeters and t is measured in seconds. (We are taking the positive direction to be downward.)

(a) Find s(0), s'(0), and s''(0) including units.

(b) What do your answers from part (a) tell you about the mass? Do your answers make sense?