

1. For each of the following functions, calculate its derivative and second derivative.

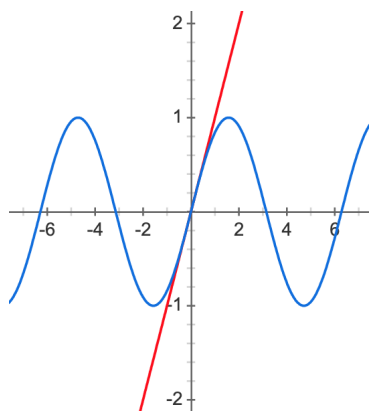
$$f(x) = 3 \sin(x) - \sec(x)$$

$$g(x) = \frac{\tan(x)}{e^x}$$

2. Calculate the  $42^{\text{nd}}$  derivative of  $\cos(x)$ .

3. Show  $\frac{d}{dx} \sin(2x) = 2 \cos(2x)$  by using the trig identities  $\sin(2x) = 2 \sin(x) \cos(x)$  and  $\cos(2x) = \cos^2(x) - \sin^2(x)$ .

4. Later we will prove  $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$ . Discuss why this makes sense from the graphs of  $y = \sin x$  and  $y = x$  below.



Then determine the following:

$$\lim_{x \rightarrow 0} \frac{\sin 3x}{3x} =$$

$$\lim_{x \rightarrow 0} \frac{\sin 5x}{2x} =$$