1 THREE IMPORTANT FUNCTIONS

The **exponential function** $f(x) = e^x$.

$$\frac{df}{dx}(x) = e^x.$$

In other words, $f'(x) = f(x)$.

The **sine** function $f(x) = \sin x$.

$$\frac{df}{dx}(x) = \cos x.$$

In other words, $\sin'(x) = \cos x$.

The **cosine** function $f(x) = \cos x$.

$$\frac{df}{dx}(x) = -\sin x.$$

In other words, $\cos'(x) = -\sin x$.

1. Compute $\tan'(x)$ and $\sec'(x)$ using the information in the boxes above.

2. Differentiate

$$f(x) = \frac{\sec x}{1 + \tan x}.$$

For what values of x does the graph of f have an horizontal tangent?

3. A weight hanging from a spring is stretched down 5 units beyond its rest position and released at time $t = 0$s to bob up and down. Its position at any later time t is

$$s(t) = 5\cos t.$$

What are its velocity and acceleration at time t? How long does it take for the weight to come back to its original position?