Exercise 1   Show that $(\cot(x))' = -\csc^2(x)$.

Exercise 2   Find $\frac{d}{dx}[\sec(x)]$.

Exercise 3   Show that $(\csc(x))' = -\csc(x)\cot(x)$.

Exercise 4   Differentiate
$$y = \frac{\cos(x)}{1 - \sin(x)}$$

Exercise 5   For what values of x does the graph of $f = e^x \cos(x)$ have a horizontal tangent?

Exercise 6   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 downward and then released, it vibrates vertically. The equation of motion is $s = 2\cos(t) + 3\sin(t)$, $t \geq 0$, where s is measured in centimeters and t in seconds. (Take the positive direction to be downward.)

(a)   Find the velocity and acceleration at time t.

(b)   Graph the velocity and acceleration functions.

(c)   When does the mass pass through the equilibrium position for the first time?

(d)   How far from its equilibrium position does the mass travel?

(e)   When is the speed the greatest?