

Math 1a. §3.4 Worksheet

Derivatives of Trigonometric Functions

Fall 2005

Differentiation Rules

- $\frac{d}{dx} \sin x = \cos x$
- $\frac{d}{dx} \cos x = -\sin x$
- $\frac{d}{dx} \tan x = \sec^2 x$
- $\frac{d}{dx} \sec x = \sec x \tan x$
- $\frac{d}{dx} \cot x = -\csc^2 x$
- $\frac{d}{dx} \csc x = -\csc x \cot x$

Exercises

1. Find f' if $f(x) = x \sin x$.
2. Find f' if $f(x) = \sin 2x$
3. Find f' if $f(x) = \sin x \tan x$
4. Find f' if $f(x) = e^x \sin x$

5. Show that the derivative of $y = \tan x$ is $y' = \sec^2 x$.

6. An elastic band is hung on a hook and a mass is hung on the lower end of the band. When the band is pulled downward and released, the mass oscillates vertically. The equation of motion is

$$s = 2 \cos t + 3 \sin t,$$

where s is measured in centimeters and $t \geq 0$ is measured in seconds. We will take the positive direction to be downward.

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

- (b) Graph the velocity and acceleration functions. A graphing calculator may be helpful here.

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

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

- (e) When is the speed of the mass the greatest? When is the mass speeding up?