Common Calculus Mistakes

Derivatives of Trigonometric Functions: Secant

Some problems provide the opportunity for more than one mistake.

The Goal

Find

$$\frac{d}{dx}\sec(x)$$

The Mistakes

Find the mistakes:

1.

$$\frac{d}{dx}\sec(x) = \frac{1}{\sin(x)} = \csc(x)$$

Need a hint? Look carefully at the red part:

$$\frac{d}{dx}\sec(x) = \frac{1}{\sin(x)} = \csc(x)$$

2.

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

Need a hint? Look carefully at the red part:

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

3.

$$\frac{d}{dx}\sec(x) = \sec\tan(x)$$

Need a hint? Look carefully at the red part:

$$\frac{d}{dx}\sec(x) = \sec\tan(x)$$

A Correct Solution

$$\frac{d}{dx}\sec(x) = \sec(x)\tan(x) \left(\text{or } \frac{\sin(x)}{\cos^2(x)} \right)$$

Explanations

In both cases the formula for the derivative is wrong. Basic derivative formulas should be learned. For secant there are two choices: memorize the correct derivative (try the flashcards at Calculus Facts); or derive the derivative using the definition of secant whenever the derivative of secant is needed:

$$\frac{d}{dx}\sec(x) = \frac{d}{dx}\frac{1}{\cos(x)} = -\frac{1}{\cos^2(x)}(-\sin(x)) = \frac{1}{\cos(x)} \cdot \frac{\sin(x)}{\cos(x)} = \sec(x)\tan(x)$$

(Note the use of the chain rule in the derivative step.)

The third mistake is one of notation - perhaps from misunderstanding function notation, or perhaps from laziness. "sec" by itself as notation has no meaning in this context without a specified input (or *argument*), and certainly the symbol "sectan(x)" is not standard usage for the product of the two function values sec(x)tan(x).