Topic: Trigonometric derivatives

Question: Find the derivative of the trigonometric function.

$$y = 4\sec x - 3x^2 \tan x$$

Answer choices:

A $y' = 4\sec x \tan x - 3x^2 \sec^2 x$

B $y' = 4\sec x \tan x - 6x \sec^2 x$

C $y' = 4\sec x \tan x - 3x^2 \sec^2 x - 6x \tan x$

D $y' = (4 - 6x)\tan x - 3x^2 \sec^2 x$

Solution: C

Let's look at one term at a time. The derivative of $4 \sec x$ is

$$4 \sec x \tan x$$

To find the derivative of $-3x^2 \tan x$, we'll need to use product rule. If $f(x) = -3x^2$ and $f'(x) = -6x$, and $g(x) = \tan x$ and $g'(x) = \sec^2 x$, then we can plug directly into the product rule formula.

$$f(x)g'(x) + f'(x)g(x)$$

$$(-3x^2)(\sec^2 x) + (-6x)(\tan x)$$

$$-3x^2 \sec^2 x - 6x \tan x$$

Putting these derivatives together, we get

$$y' = 4 \sec x \tan x - 3x^2 \sec^2 x - 6x \tan x$$

Topic: Trigonometric derivatives

Question: Find the derivative of the trigonometric function.

$$y = 2 \sin x \csc x$$

Answer choices:

A $y' = 0$

B $y' = -4 \cot x$

C $y' = 4 \cot x$

D $y' = -2 \cot x + 2 \tan x$

Solution: A

Use the product rule with

$$f(x) = 2 \sin x$$

$$f'(x) = 2 \cos x$$

and

$$g(x) = \csc x$$

$$g'(x) = -\csc x \cot x$$

Then the derivative is

$$y' = f(x)g'(x) + f'(x)g(x)$$

$$y' = (2 \sin x)(-\csc x \cot x) + (2 \cos x)(\csc x)$$

$$y' = -2 \sin x \csc x \cot x + 2 \cos x \csc x$$

$$y' = -2 \cot x + 2 \cot x$$

$$y' = 0$$

Topic: Trigonometric derivatives

Question: Find the derivative of the trigonometric function.

$$y = 7 \cot x$$

Answer choices:

A $\qquad y' = -7 \csc^2 x$

B $\qquad y' = 7 \csc^2 x$

C $\qquad y' = 7 \csc x$

D $\qquad y' = -7 \csc x$

Solution: A

The derivative of $y = \cot x$ is $y' = -\csc^2 x$. So the derivative will be

$$y' = 7(-\csc^2 x)$$

$$y' = -7\csc^2 x$$