Topic: Chain rule with trig, log, and exponential functions

Question: Find the derivative of the trigonometric function.

$$y = \sin(3x^2 + 11x)$$

## **Answer choices:**

A 
$$y' = -(6x + 11)\cos(3x^2 + 11x)$$

B 
$$y' = -(6x + 11)\sin(3x^2 + 11x)$$

C 
$$y' = (6x + 11)\cos(3x^2 + 11x)$$

D 
$$y' = (6x + 11)\sin(3x^2 + 11x)$$

## Solution: C

Set  $u = 3x^2 + 11x$  and u' = 6x + 11. Then  $y = \sin u$ , and the derivative is

$$y' = \cos u \cdot u'$$

$$y' = \cos(3x^2 + 11x) \cdot (6x + 11)$$

$$y' = (6x + 11)\cos(3x^2 + 11x)$$



Topic: Chain rule with trig, log, and exponential functions

Question: Find the derivative of the exponential function.

$$y = e^{\sqrt{x+1}}$$

## **Answer choices:**

$$\mathbf{A} \qquad y' = \frac{e^{\sqrt{x+1}}}{2\sqrt{x+1}}$$

$$\mathsf{B} \qquad y' = \frac{e^{\sqrt{x}}}{2\sqrt{x+1}}$$

C 
$$y' = \frac{e^{\sqrt{x+1}}}{\sqrt{x+1}}$$
D 
$$y' = e^{\sqrt{x+1}}$$

$$D y' = e^{\sqrt{x+1}}$$

Solution: A

Make a substitution, letting  $u = \sqrt{x+1}$  and

$$u' = \frac{1}{2\sqrt{x+1}}$$

Then the function is

$$y = e^u$$

and the derivative is

$$y' = e^u \cdot u'$$

$$y' = e^{\sqrt{x+1}} \cdot \frac{1}{2\sqrt{x+1}}$$

$$y' = \frac{e^{\sqrt{x+1}}}{2\sqrt{x+1}}$$

Topic: Chain rule with trig, log, and exponential functions

Question: Find the derivative of the logarithmic function.

$$y = \ln(x^2 - 5x)$$

## **Answer choices:**

$$\mathbf{A} \qquad y' = \frac{2x+5}{x^2+5x}$$

$$B \qquad y' = \frac{2x - 5}{x^2 - 5}$$

C 
$$y' = \frac{5 - 2x}{x^2 - 5x}$$

D 
$$y' = \frac{2x - 5}{x^2 - 5x}$$

Solution: D

Let  $u = x^2 - 5x$  and u' = 2x - 5. Then the function is

$$y = \ln u$$

and the derivative is

$$y' = \frac{1}{u} \cdot u'$$

$$y' = \frac{1}{x^2 - 5x} \cdot (2x - 5)$$

$$y' = \frac{2x - 5}{x^2 - 5x}$$