

**Topic:** Higher-order derivatives**Question:** Find the second derivative of the function.

$$y = e^{-4x^2}$$

**Answer choices:**

A  $y'' = 8e^{-4x^2}(2x^2 - 1)$

B  $y' = 16xe^{-4x^2}$

C  $y'' = 64xe^{-4x^2}$

D  $y'' = 8e^{-4x^2}(8x^2 - 1)$



**Solution: D**

First we need to find the first derivative using the chain rule

$$y = e^{-4x^2}$$

$$y' = e^{-4x^2}(-8x)$$

$$y' = -8xe^{-4x^2}$$

Now we can find the second derivative by taking the derivative of the first derivative using the product rule.

$$y'' = (y')' = (-8xe^{-4x^2})'$$

$$y'' = -8e^{-4x^2} + (-8xe^{-4x^2}(-8x))$$

$$y'' = -8e^{-4x^2} + 64x^2e^{-4x^2}$$

$$y'' = 8e^{-4x^2}(8x^2 - 1)$$



**Topic:** Higher-order derivatives**Question:** Find the second derivative of the function.

$$y = (5x + 7)^8$$

**Answer choices:**

A  $y'' = 1,400(5x + 7)^6$

B  $y'' = 140(5x + 7)^6$

C  $y'' = 280(5x + 7)^6$

D  $y'' = 200(5x + 7)^6$



**Solution: A**

First we need to find the first derivative using the chain rule

$$y = (5x + 7)^8$$

$$y' = 8(5x + 7)^7(5)$$

$$y' = 40(5x + 7)^7$$

Now we can find the second derivative by taking the derivative of the first derivative.

$$y'' = (y')' = (40(5x + 7)^7)'$$

$$y'' = 40 \cdot 7(5x + 7)^6(5)$$

$$y'' = 1,400(5x + 7)^6$$



**Topic:** Higher-order derivatives**Question:** Find the third derivative of the function.

$$y = 4x^4 - 5x^3 + 2x$$

**Answer choices:**

A  $y''' = 96$

B  $y''' = 96x - 30$

C  $y''' = 66x$

D  $y''' = 48x - 30$



**Solution: B**

First we need to find the first derivative using the chain rule

$$y = 4x^4 - 5x^3 + 2x$$

$$y' = 16x^3 - 15x^2 + 2$$

Now we can find the second derivative by taking the derivative of the first derivative.

$$y'' = (y')' = (16x^3 - 15x^2 + 2)'$$

$$y'' = 48x^2 - 30x$$

Find the third derivative by taking the derivative of the second derivative.

$$y''' = (y'')' = (48x^2 - 30x)'$$

$$y''' = 96x - 30$$

