

**Topic:** Exponential derivatives

**Question:** Find the derivative of the exponential function.

$$y = e^{2x+1}$$

**Answer choices:**

A  $y' = e^{2x+1}$

B  $y' = 2e^{2x+1}$

C  $y' = 2e^{3x}$

D  $y' = (2x + 1)e^{2x+1}$



**Solution: B**

Make a substitution, letting  $u = 2x + 1$  and  $u' = 2$ . Then the function is

$$y = e^u$$

and the derivative is

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

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

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



**Topic:** Exponential derivatives**Question:** Find the derivative of the exponential function.

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

**Answer choices:**

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

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

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

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



**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:** Exponential derivatives

**Question:** Find the derivative of the exponential function.

$$y = 4xe^{5x^2-2}$$

**Answer choices:**

- A  $y' = 4e^{5x^2-2}(5x + 1)$
- B  $y' = 4e^{5x^2-2}(5x^2 + 1)$
- C  $y' = 4e^{5x^2-2}(10x^2 + 1)$
- D  $y' = 4e^{5x^2-2}(10x + 1)$



**Solution: C**

We'll apply product rule with

$$f(x) = 4x$$

$$f'(x) = 4$$

and

$$g(x) = e^{5x^2-2}$$

$$g'(x) = 10xe^{5x^2-2}$$

Then the derivative is

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

$$y' = (4x)(10xe^{5x^2-2}) + (4)(e^{5x^2-2})$$

$$y' = 40x^2e^{5x^2-2} + 4e^{5x^2-2}$$

The terms in the denominator share a common factor of  $4e^{5x^2-2}$ , so factor that out.

$$y' = 4e^{5x^2-2}(10x^2 + 1)$$

