Topic: Exponential derivatives

Question: Find the derivative of the exponential function.

$$y = 3e^x + 10x$$

Answer choices:

A $y' = 3e^x$

B $y' = 3e^x + 10$

C $y' = e^x + 10$

D $y' = e^x$

Solution: B

The base is e and the exponent is x, so the derivative of $3e^x$ is $3e^x$ and the derivative of the function is

$$y' = 3e^x + 10$$

Topic: Exponential derivatives

Question: Find the derivative of the exponential function.

$$y = 7^x - 3x^{-4}$$

Answer choices:

A $\quad y' = 7^x \ln(7) + 12x^{-5}$

B $\quad y' = 7^x \ln(7) + 12x^{-3}$

C $\quad y' = 7^x \ln(7)$

D $\quad y' = 7^x \ln(7) - 3x^{-5}$

Solution: A

In the function 7^x, $a = 7$ and the exponent is x. We'll differentiate by applying the formula for exponential derivatives.

$$a^x(\ln a)$$

$$7^x(\ln(7))$$

$$7^x \ln(7)$$

Then the derivative is

$$y' = 7^x \ln(7) + 12x^{-5}$$

Topic: Exponential derivatives

Question: Find the derivative of the exponential function.

$$y = 4xe^x - x^4 2^x$$

Answer choices:

A $\qquad y' = 4xe^x + 2^x x^3(x \ln 2 + 4)$

B $\qquad y' = 4xe^x + 2^x x^4 \ln 2$

C $\qquad y' = 4e^x(x + 1) - 2^x x^3(x \ln 2 + 4)$

D $\qquad y' = 4e^x(x + 1) - 2^x x^3(x \ln 2 - 4)$

Solution: C

We'll apply product rule with

$$f(x) = 4x$$

$$f'(x) = 4$$

and

$$g(x) = e^x$$

$$g'(x) = e^x$$

Then the derivative is

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

$$(4x)(e^x) + (4)(e^x)$$

$$4xe^x + 4e^x$$

We'll apply product rule with

$$f(x) = x^4$$

$$f'(x) = 4x^3$$

and

$$g(x) = 2^x$$

$$g'(x) = 2^x \ln 2$$

Then the derivative is

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

$$(x^4)(2^x \ln 2) + (4x^3)(2^x)$$

$$x^4 2^x \ln 2 + 4x^3 2^x$$

Then the derivative of the function is

$$y' = 4xe^x + 4e^x - (2^x x^4 \ln 2 + 4 \cdot 2^x x^3)$$

$$y' = 4e^x(x + 1) - 2^x x^3(x \ln 2 + 4)$$