Natural exponential function and its derivative

6 questions | 14 marks

Equivalent correct methods earn the corresponding marks.

1. Differentiate $7e^x - 3$. [2 marks]

Use $(e^x)' = e^x$.

The constant differentiates to zero.

Answer: $7e^x$

2. Differentiate e^{-3x}. [2 marks]

Retain the exponential.

Multiply by the exponent derivative -3.

Answer: $-3e^{-3x}$

3. Differentiate e^{x^2+2x}. [2 marks]

Differentiate the exponent.

Multiply by the unchanged exponential.

Answer: $(2x+2)e^{x^2+2x}$

4. Find the tangent to $y = e^{2x}$ at $x = 0$. [2 marks]

The point is $(0, 1)$.

The derivative is $2e^{2x}$, giving gradient 2.

Answer: $y = 2x + 1$

5. Differentiate x^2e^{-x}. [3 marks]

Use the product rule.

The derivative of e^{-x} is $-e^{-x}$.

Answer: $e^{-x}(2x - x^2)$

6. Explain why $f(x) = e^{x^2}$ decreases for $x < 0$ although e^u increases with u. [3 marks]

The derivative is $2xe^{x^2}$.

The exponential is positive but $2x < 0$ on $x < 0$.

Answer: Its inner input x^2 decreases as x increases towards zero.