Derivative notation and the derivative function

6 questions | 18 marks

Equivalent correct methods earn the corresponding marks.

1. If $f'(x) = 2x + 5$, calculate $f'(-2)$ and interpret it. [3 marks]

$2(-2) + 5 = 1$.

It is a slope, not a height.

Answer: 1; tangent gradient at $x = -2$.

2. For $y = 4x^2 - 1$, write the derivative using Leibniz notation. [3 marks]

The derivative of $4x^2$ is $8x$; the constant contributes 0.

Answer: $\frac{dy}{dx} = 8x$

3. V is in litres and t in minutes. State the units of $\frac{dV}{dt}$. [3 marks]

Divide the dependent-variable units by the independent-variable units.

Answer: Litres per minute

4. $A = \pi r^2$ and $\frac{dA}{dr} = 2\pi r$, with r in cm. Evaluate the derivative at 3 and give units. [3 marks]

Substitute $r = 3$ to obtain 6π.

Area-change units divided by radius-change units are cm²/cm.

Answer: 6π cm² per cm

5. For $f(x) = x^2 + 3x$, find $f(1)$ and $f'(1)$. [3 marks]

$f(1) = 1 + 3 = 4$.

$f'(x) = 2x + 3$, so $f'(1) = 5$.

Answer: 4 and 5

6. A student writes $f'(2) = f(2)^2$. Explain the error. [3 marks]

One operation measures a rate and the other squares an output value; they need not agree.

Answer: The prime denotes differentiation, not squaring.