Review of derivatives and polynomial rules

6 questions | 15 marks

Equivalent correct methods earn the corresponding marks.

1. Differentiate $3x^5 - 2x^2 + 9$. [2 marks]

Apply the power rule to both variable terms.

The derivative of 9 is zero.

Answer: $15x^4 - 4x$

2. Find the gradient of $y = x^3 - 4x$ at $x = -1$. [2 marks]

The derivative is $3x^2 - 4$.

At $x = -1$, this is $3 - 4 = -1$.

Answer: -1

3. Differentiate $x^{-2} + 4x^{1/2}$ and state a real domain for the derivative. [3 marks]

Differentiate the two powers.

The square-root derivative and reciprocal require $x > 0$.

Answer: $-2x^{-3} + 2x^{-1/2}$, for $x > 0$.

4. Find a tangent equation to $y = 2x^2 - x$ at $x = 1$. [3 marks]

The point is $(1, 1)$.

The derivative $4x - 1$ gives gradient 3.

Use $y - 1 = 3(x - 1)$.

Answer: $y = 3x - 2$

5. A water-volume model is $V(t) = 50 + 6t - t^2$ litres, for $0 \le t \le 3$ seconds. Find and interpret $V'(2)$. [3 marks]

Differentiate to get $V'(t) = 6 - 2t$.

At 2 seconds, the rate is 2 L/s.

Answer: 2 litres per second: volume is increasing.

6. A student says the derivative of $5x^3$ is $5x^2$. Explain the error and correct it. [2 marks]

The exponent 3 must multiply the coefficient.

Lowering the exponent alone omits this factor.

Answer: $15x^2$