Derivative sign and increasing/decreasing intervals

6 questions | 18 marks

Equivalent correct methods earn the corresponding marks.

1. Find the increasing/decreasing intervals of $f(x) = x^2 + 6x$. [3 marks]

$f'(x) = 2x + 6$ changes from − to + at −3.

Answer: Decreasing x<−3; increasing x>−3.

2. Analyse $f'(x) = 4 - 2x$. [3 marks]

The derivative is positive before 2 and negative after 2.

Answer: Increasing x<2; decreasing x>2.

3. Find the sign intervals of $f'(x) = 3(x - 2)(x + 1)$. [3 marks]

Roots are −1 and 2. Testing −2, 0 and 3 gives +, −, +.

Answer: Positive x<−1 or x>2; negative −1<x<2.

4. If $g'(x) = -(x - 1)(x - 4)$, where is g increasing? [3 marks]

The leading minus gives derivative signs −, +, − across 1 and 4.

Answer: 1<x<4

5. $h'(x) = 3x^2$. Is h decreasing anywhere? [3 marks]

$3x^2$ is positive for x≠0 and 0 at x=0; it is never negative.

Answer: No. It is increasing on both sides of 0.

6. A graph is below the x-axis but has positive tangent gradients. Is it increasing or decreasing? [3 marks]

Its values rise as x increases, even while those values remain negative.

Answer: Increasing