Exercise 1

Paper 1 style · No calculator

1 7 marks SL 5.2 · 5.7 ●○○ Routine

Let $f(x) = x^3 - 3x^2 - 9x + 2$.

(a) Find $f'(x)$. **[1]**

(b) Find the values of x for which f is increasing. **[3]**

(c) Find $f''(x)$, and the values of x for which the graph of f is concave down. **[3]**

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MARKSCHEME (a)

$f'(x) = 3x^2 - 6x - 9$ **A1**

Total 1 mark

MARKSCHEME (b)

$3(x+1)(x-3) > 0$ **M1**

zeros $x = -1, x = 3$ **A1**

$x < -1$ or $x > 3$ **A1**

Total 3 marks

Note Two intervals: outside the zeros, since f' is a parabola opening upwards. $-1 < x < 3$ is the interval where f decreases: M1A1A0.

MARKSCHEME (c)

$f''(x) = 6x - 6$ **A1**

$6x - 6 < 0$ **M1**

$x < 1$ **A1**

Total 3 marks