# Exercise 1

Paper 1 style · No calculator

## 1 7 marks SL 5.8 ●○○ Routine

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

**(a)** Find the coordinates of the stationary points of the graph of $f$. **[4]**

**(b)** Use the second derivative to determine the nature of each stationary point. **[3]**

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**MARKSCHEME (a)**

$f'(x) = 3x^2 + 6x - 9 = 0$ **M1**

$3(x+3)(x-1) = 0$: $x = -3,\ x = 1$ **A1**

$(-3,\ 25)$ **A1**

$(1,\ -7)$ **A1**

Total 4 marks

**MARKSCHEME (b)**

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

$f''(-3) = -12 < 0$: local maximum at $(-3,\ 25)$ **R1**

$f''(1) = 12 > 0$: local minimum at $(1,\ -7)$ **R1**

Total 3 marks

**Note** Each R1 needs the sign of $f''$ and the conclusion. The first derivative test earns no marks here: the question asks for the second derivative.