Exercise 1

Paper 1 style · No calculator

1 7 marks SL 5.6 ●●○ Typical

Let $f(x) = x^2(2x-1)^3$.

(a) Show that $f'(x) = 2x(2x-1)^2(5x-1)$. **[4]**

(b) Find the values of x at which the graph of f has a horizontal tangent. **[3]**

The markscheme is on the next page: try the question first. Written and verified by a practising IB mathematics teacher, produced with AI assistance; solved twice and recomputed by software. Not affiliated with or endorsed by the International Baccalaureate Organization.
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MARKSCHEME (a)

attempt at the product rule, with $u = x^2$ and $v = (2x-1)^3$ **M1**

$v' = 3(2x-1)^2 \times 2 = 6(2x-1)^2$ **A1**

$f'(x) = 2x(2x-1)^3 + 6x^2(2x-1)^2$ **A1**

$= 2x(2x-1)^2\big[(2x-1) + 3x\big]$ **A1**

$= 2x(2x-1)^2(5x-1)$ **AG**

Total 4 marks

Note The common factor $2x(2x-1)^2$ is taken out: expanding everything earns the marks only if the factorised form is then reached.

MARKSCHEME (b)

$f'(x) = 0$ **M1**

$x = 0,\ x = \frac{1}{2}$ **A1**

$x = \frac{1}{5}$ **A1**

Total 3 marks