Mixed Exercise 12.01 - Differentiation (Year 1 Pure Maths)

1 *A curve has equation* $y = f(x)$.

- *Given that* $f(x)$ *is cubic with the coefficient of* x^2 *equal to the coefficient of* x.
- *The curve with equation* $y = f(x)$ *passes through the point* $(0, 5)$.
- *The curve with equation* $f(x)$ *has stationary point* $(2, -3)$

(a) Find f(x) *(7 marks)*

(b) Show that the stationary point at $(2, -3)$ *is a minimum.* *(2 marks)*

2 *A solid right circular cylinder has radius r cm and height h cm.*

The total surface area of the cylinder is $500\ cm^2$.

(a) Show that the volume, $V\ cm^3$, *of the cylinder is given by:*

$$V = 250r - \pi r^3.$$ *(3 marks)*

Given that r varies,

(b) Use calculus to find the maximum value of V, *to the nearest* cm^3. *(5 marks)*

(c) Justify that the value of V *in (b) is maximum.* *(1 marks)*