

Name:

Roll Number:

Section: B\_\_

**Note:** Justify your answers (as always!).

Let  $a, b, c, d \in \mathbb{R}$  be four *constants*, with  $a \neq 0$ . We define  $f : \mathbb{R} \rightarrow \mathbb{R}, x \mapsto ax^3 + bx^2 + cx + d$ , a cubic polynomial function.

Question 1) Use the **First Derivative test** to determine the point(s) where  $f$  can have a local extremum (either local maximum or local minimum).

You should find a condition on  $a, b, c, d$  for the local extrema to exist, and their (possible) location should also depend on the coefficients  $a, b, c, d$ .

Question 2) Use the **Second Derivative test** to determine which of these extremum is a *local* maximum and which is a *local* minimum.

Question 3) Apply this to find the local maximum and local minimum for this function  $f : x \mapsto 2x^3 + 4x^2 - 5x - 1$  (if they exist).

**Answer:**

You can use the back of the sheet if you need.

You can use this side of the sheet if you need.