

### Question 1

Use the *Second Geometric Optimality Conditions* to show that:

$$\left(\frac{3}{2}, \frac{1}{4}\right)^T \in \arg \min \{x_1 + x_2 \mid (x_1 - 2)^2 - x_2 \leq 0, -x_1 \leq 0, -x_2 \leq 0\}.$$

All necessary working must be shown.

### Question 2

Show that the following function is convex:

$$f : \mathbb{R}^2 \rightarrow \mathbb{R}$$
$$f(x_1, x_2) = \exp(|x_1| + |x_2|) - \frac{1}{x_1^4 + x_2^4 + 1}.$$

You may use any theorems found in the notes. However, to show that the function  $g(\mathbf{x}) = |x_1| + |x_2|$  is convex, it is recommended that you use the definition of convexity.