Optimization Word Problems and Rolle’s Theorem

Instructions. Put the first and last name of everyone in your workgroup at the top of your paper. Everyone is to do their own worksheet but only one from each group is graded with the score shared. Be sure to show your work and explain your reasoning.

1. State Rolle’s Theorem. Be sure to include IF and THEN.

2. State the Intermediate Value Theorem. Be sure to include IF and THEN.

3. Use the Intermediate Value Theorem to show that \( x^5 + 4x = 1 \) has at least one solution.

4. Use Rolle’s Theorem to show that \( x^5 + 4x = 1 \) cannot have two solutions. Therefore we may conclude that it has exactly one solution.
5. Which point on the graph of \( y = \sqrt{5x} \) is closest to the point \((10,0)\)?

6. What is the area of the largest rectangle that can fit with one edge on the \( x \)-axis, one edge on the \( y \)-axis and touching the line \( y = 2 - x \) at one point?

7. Show that the point between two posts of fixed lengths \( A \) and \( B \) which minimizes the distance \( \alpha + \beta \) has the property that \( \frac{\alpha}{\beta} = \frac{A}{B} \).