1.) (5 pts.) Evaluate the limit \( \lim_{{x \to \infty}} \frac{7x^2 - 2x + 1}{13x^2 + 8x} \). You need to show steps here or describe your thought process; if your answer is just a number, you will receive no credit.

\[
\frac{7x^2 - 2x + 1}{13x^2 + 8x} = \frac{x^2 \left( 7 - \frac{2}{x} + \frac{1}{x^2} \right)}{x^2 \left( 13 + \frac{8}{x} \right)} \quad \rightarrow \quad \frac{7}{13} \quad \text{as} \quad x \to \infty
\]

2.) (5 pts.) Suppose we want to maximize a profit function \( P(x) \). We find that there are two critical points, at \( x = 2 \) and \( x = 4 \). Describe a calculus test we can use to determine whether the profit is maximized, minimized, or neither at these points.

**Second Derivative Test:**

At, say, \( x = 2 \):

- If \( P''(2) > 0 \),
  - \( P \) is concave up
  - \( P \) has a min at \( x = 2 \)
- If \( P''(2) < 0 \),
  - \( P \) is concave down
  - \( P \) has a max at \( x = 2 \)
- If \( P'' = 0 \), not enough information
  (Similarly for \( x = 4 \).)

**First Derivative Test:**

Test the signs of \( P' \) at points less than 2, between 2 and 4, and greater than 4. If, around \( x = 2 \) or \( x = 4 \),

- \( P \) changes from negative to positive
  THEN \( P \) has a min at that \( x \)-value

- \( P \) changes from positive to negative
  THEN \( P \) has a max at that \( x \)-value