Show all work: unjustified answers may receive less than full credit.

1. Find the critical points of the function \( F(x) = x^{\frac{4}{5}}(x - 4)^2 \).

\[
F'(x) = \frac{4}{5}x^{-\frac{1}{5}}(x - 4) + \frac{4}{5}x^{-\frac{1}{5}}(x - 4)^2
\]

\[
= 2x^{-\frac{1}{5}}(x - 4) \left[ x + \frac{3}{5}(x - 4) \right]
\]

\[
= 2x^{-\frac{1}{5}}(x - 4) \left[ \frac{7}{5}x - \frac{8}{5} \right]
\]

Critical pts: \( x = 4, \frac{8}{7} \) when \( F'(x) = 0 \)

\( x = 0 \) when \( F'(x) \) DNE

2. Find the points on the ellipse \( 4x^2 + y^2 = 4 \) that are furthest away from the point \((1, 0)\).

[Diagram of ellipse with labeled points and steps]

Step 1: Maximize distance on ellipse from \( P^t \), \((1, 0)\) (I will actually do distance squared to avoid sq. roots)

Step 3: \( d^2 = (1-x)^2 + (0-y)^2 \)

Step 4: \( 4x^2 + y^2 = 4 \Rightarrow y^2 = 4(1-x^2) \)

\( d^2 = (1-x)^2 + 4(1-x^2) \)

Step 5: \( \frac{d(d^2)}{dx} = -2(1-x) - 8x = 0 \)

\(-2 = 6x \)

\( x = -\frac{1}{3} \)

\( y^2 = 4(1-\left(-\frac{1}{3}\right)^2) = \frac{32}{9} \Rightarrow y = \mp \frac{4\sqrt{2}}{3} \)

Furthest pts are \((-\frac{1}{3}, \frac{4\sqrt{2}}{3})\), \((-\frac{1}{3}, -\frac{4\sqrt{2}}{3})\)