Math 151 Lab 5

Use Python to solve each problem.

1. Given $f(x) = x^{3/4}$:
   a) Find the linearization $L(x)$ of the function f at $a = 16$. (REMEMBER: The linearization is just the equation of the tangent line, which you've done before!)
   b) Plot the function f and the linearization L on the domain $x \in [0, 30]$.
   c) Use your answer from part a) to approximate $16.1^{3/4}$. Compare your approximation by calculating $16.1^{3/4}$ directly in Python.
   d) Use your answer from part a) to approximate $17^{3/4}$. Compare your approximation by calculating $17^{3/4}$ directly in Python.
   e) State which estimation (part c or part d) was more accurate and why.
2. Given $f(x) = x^{4/5}(x-4)^2$:
   a) Find f' and the critical values of f
   (HINT 1: If you want exact answers, enter the exponent as **Rational(4,5)** instead of 4/5.
   HINT 2: Remember anything with negative exponents is technically in the denominator!)
   b) Plot f on the interval $x \in [-1, 6]$ (HINT: Python does not handle negative bases, so plot $|x|^{4/5}(x-4)^2$ instead!).
   c) State which critical values are local maxima and which are local minima based on the graph.
3. Given $f(x) = \dfrac{x^2 + 7x + 3}{x^2}$
   a) Find the critical values of f on the interval $\left[-3, -\dfrac{1}{2}\right]$ and determine which has the maximum y-value and which has the minimum y-value.
   b) Repeat part a) but use the interval $[-3, 1]$. Explain in a print statement why you cannot be certain these are the absolute extrema of the function on this interval.
   c) Plot f on the domain $x \in [-3, 1]$ and range $y \in [-5, 20]$ (use the **ylim** option in your plot command-see the help documentation). Based on the graph, state correctly the absolute extrema of f on the interval $[-3, 1]$.