

Show all work. Arithmetic expressions do not need to be simplified in your final answer.

1. **(5 points)** Using linear approximation techniques, find a good rational estimate for the value of $\sqrt[4]{15.9984}$.

2. **(6 points)** Find the values of x which minimize and maximize the function $f(x) = x^3 - 9x^2 - 21x + 10$ on the interval $[-2, 2]$.

3. **(8 points)** Answer the following questions about the function $f(x) = x^4 - 8x^3 + 18x^2 - 2$.
 - (a) **(4 points)** On what intervals is it increasing, and on what intervals is it decreasing?

 - (b) **(2 points)** What x -values are local extrema of this function, and what type of extremum is each?

 - (c) **(3 points)** On what intervals is this function concave up, and on which intervals is it concave down? Where are the points of inflection?

4. **(2 point bonus)** On the back of this sheet, give a formula for a continuous function with infinitely many local minima, infinitely many local maxima, exactly one global maximum, and no global minimum. Justify your assertion.