1. Write out the abstract partial fractions decomposition for the following. You need not solve for the constants.
   (a) \( \frac{x^2 + x + 1}{x^3 + 4x} \)

   (b) \( \frac{x^3 + 7x^2 - 13}{x^3(x^2 + 1)^2(x+1)} \)

2. Find the integral \( \int \frac{3x+1}{x^2+2x+4} \, dx \).
3. Consider the integral $\int_1^5 x^2 \, dx$. Use the Trapezoid Rule and Simpson’s Rule to find $T_4$ and $S_4$.

4. Find an $n$ that would guarantee that Simpson’s Rule $S_n$ is within $10^{-8}$ of $\int_1^4 x^{3/2} \, dx$. You may leave your answer abstractly with roots. The error bound for Simpson’s Rule to $\int_a^b f(x) \, dx$ is

$$
\frac{M_4(b-a)^5}{180n^4},
$$

where $M_4$ is any upper bound such that $|f^{(4)}(x)| \leq M_4$ for all $a \leq x \leq b$. You are given help that $\frac{d^4}{dx^4} \left( x^{3/2} \right) = \frac{9}{16} x^{-5/2}$.  