1 Compute \( \int x e^{5x} \, dx \).

2 Compute \( \int \sin^2(3t) \, dt \).

3 Compute \( \int \frac{1}{\sqrt{x^2-4}} \, dx \).

4 Compute \( \int \tan^3 \theta \sec \theta \, d\theta \).

5 Compute \( \int_1^\infty \frac{1}{(3x+1)^2} \, dx \).

6 Compute \( \int \frac{1}{x^2-2x+5} \, dx \).

7 Compute \( \int \frac{1}{x^2-6x+5} \, dx \).

8 Write out the form of the partial fraction decomposition of the function
\[
\frac{x^4 + 1}{x^5 + 4x^3}
\]
Do not determine the numerical values of the coefficients.

9 Use the Comparison Theorem to determine if the following converges or diverges.
\[
\int_1^\infty \frac{x + 1}{\sqrt{x^4 - x}} \, dx
\]

10 For any continuous function \( f \) on \([a, b]\), \( P(f) \) will approximate \( \int_a^b f(x) \, dx \) to an error no more than \( \frac{K_0(b-a)^3}{5} \) when \( |f(x)| \leq K_0 \) for all \( x \) in \([a, b]\). You use \( P(f) \) to numerically approximate the integral \( \int_0^1 \sin x \, dx \) by subdividing the interval into 100 equal pieces and applying \( P(f) \) to each of the smaller intervals. What is an upper bound for the error of your approximation and why?

11 Compute \( \int \frac{1}{1+e^x} \, dx \).

12 Compute \( \int \tan^{-1}(\sqrt{x}) \, dx \).