Math 231 Exam 1

UIUC, October 25, 2010

1 Compute $\int xe^{5x}\,dx$.

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 $|f(x)| \le K_0$ 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 $\int \tan^{-1}(\sqrt{x})\,dx$