

1553 Spring 09 Practice Test 1

SHOW YOUR WORK. Each question is worth 10 points.

1. For the integral $\int_2^4 \frac{1}{x^3} dx$, determine how large n must be so that the error in the midpoint approximation M_n is at most 10^{-4} .

2. Evaluate $\int x^2 e^x dx$.

3. Derive a reduction formula for $\int \sin^n x dx$.

4. Evaluate $\int \sin^3 x \cos^2 x dx$.

5. Evaluate

$$\int \frac{dx}{(4-x^2)^{3/2}}.$$

6. Find the partial fraction decomposition of

$$\frac{3x+16}{(x+2)^2(x-3)}$$

[Do find the numerical values of the constants; DON'T integrate the function.]

7. Determine whether the integral $\int_1^\infty \frac{1}{x^4} dx$ converges or diverges, and if it converges, find its value.

8. Use the definition of the limit of a sequence to prove that $\lim_{n \rightarrow \infty} \frac{2n-1}{n+1} = 2$.

9. Let the sequence $\{a_n\}$ be defined recursively by $a_0 = 0$ and $a_n = \sqrt{12 + a_{n-1}}$ for $n > 0$. Prove that $\{a_n\}$ is increasing and bounded, and find $\lim_{n \rightarrow \infty} a_n$.

10. Determine whether the series $\sum_{n=1}^\infty \frac{2^{n+1}}{3^n}$ converges or diverges. If it converges, find its sum.