

Name: _____

VIP ID: _____

- Write your name and VIP ID in the space provided above.
- The test has eight (8) pages, including this one, and two pages of scratch paper (pages 7, 8).
- It also has a formula sheet attached. **You may detach this formula sheet only when prompted to do so. Failure to comply will result in losing the privilege to use it.**
- Enter your answers in the boxes provided.
- You must show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.
- Credit for each problem is given in parentheses at the right of the problem number.
- No books or notes may be used on this test. A graphing calculator is allowed.

Page	Max. points	Your points
2	20	
3	20	
4	20	
5	20	
6	20	
Total	100	

Problem 1 (5 pts). Evaluate the integral $\int x e^x dx$.

Problem 2 (5 pts). Evaluate the integral $\int (x - 3)\sqrt{x^2 - 6x + 5} dx$.

Problem 3 (5 pts). Evaluate the integral $\int \sin^2 x \cos^3 x dx$.

Problem 4 (5 pts). Evaluate the integral $\int \frac{x^3 + 1}{(x + 1)^2(x^2 + 4)} dx$.

Problem 5 (10 pts). Evaluate the following integral, or indicate if it is divergent: $\int_0^{\pi^2/4} \frac{\cos \sqrt{t}}{\sqrt{t}} dt$

Problem 6 (10 pts). Consider the region in the xy -plane enclosed by the cardioid with polar equation $r = 2(1 + \cos \theta)$ (assume $0 \leq \theta \leq 2\pi$). Express its area with an integral in terms of the parameter θ , and compute its value.

Problem 7 (10 pts). Find the general term of the sequence $\{3, 2, \frac{5}{3}, \frac{3}{2}, \frac{7}{5}, \frac{4}{3}, \dots\}$, and compute its limit.

Problem 8 (5 pts—all or nothing). Compute the limit of the sequence $\left\{ \frac{n^2 + 5n + 2}{n^2 + 2n} \right\}_{n=1}^{\infty}$

Problem 9 (5 pts). Find a power series representation of the function $f(x) = x^2 \cos(2x)$

Problem 10 (10 pts). Study the convergence of the series $\sum_{n=2}^{\infty} \frac{3^n + 4^n}{5^n}$. If convergent, evaluate the sum.

Problem 11 (10 pts). Classify the series $\sum_{n=1}^{\infty} \frac{(-1)^n n}{e^n}$ as absolutely convergent, conditionally convergent, or divergent.

Problem 12 (10 pts). Find the interval of convergence of the power series $\sum_{n=0}^{\infty} \frac{(-3)^n x^n}{\sqrt{n+1}}$.

Problem 13 (10 pts). Express the function $f(x) = \frac{2x}{x^3 + 8}$ as a power series.

Scratch paper

Scratch paper