

ON THE FRONT OF YOUR BLUEBOOK write: (1) your name, (2) your student ID number, (3) lecture section (4) your instructor's name, and (5) a grading table. You must work all of the problems on the exam. Show ALL of your work in your bluebook and **BOX IN YOUR FINAL ANSWERS**. A correct answer with no relevant work may receive no credit, while an incorrect answer accompanied by some correct work may receive partial credit. Text books, class notes, and calculators are NOT permitted.

1. (20 points) Evaluate the following integrals. Be sure to show all your work.

(a) $\int x \ln(2x) dx$ (b) $\int \frac{dx}{\sqrt{4x-x^2}}$ (c) $\int_0^4 \frac{dx}{(x-2)^4}$

2. (15 points) Determine whether the following integrals converge or not. Explain your reasoning.

(a) $\int_1^\infty \frac{4}{\sqrt{x^2+5}} dx$ (b) $\int_3^\infty \frac{dx}{x \ln x}$

3. (15 points)

(a) Decompose $\frac{-4x+3}{(x^2+1)(x-2)}$ using partial fractions.

(b) Evaluate $\int \frac{-4x+3}{(x^2+1)(x-2)} dx$.

4. (30 points) For each sequence $\{a_n\}$ below, determine if the sequence converges, and if so, to what limit. If the sequence diverges, state this. Be sure to fully support your answer.

(a) $a_n = \frac{\sin n}{n^2}$ (c) $a_n = \left(\frac{n-2}{n}\right)^n$

(b) $a_n = \frac{3^n}{n^3}$ (d) $a_n = n^{(2/\ln n)}$

5. (20 points) Determine if each series below converges or diverges. If possible, for each convergent series determine the sum of the series. Be sure to fully support your answer.

(a) $\sum_{n=0}^{\infty} \left(1 - \frac{2}{n}\right)^n$ (b) $\sum_{n=3}^{\infty} \frac{1}{n \ln n}$ (c) $\sum_{n=0}^{\infty} \frac{2^n + 1}{3^{2n}}$