

Exam 1

Answer all 5 questions for a total of 101 points. Write your solutions in the accompanying blue book, and put a box around your final answers. If you solve the problems out of order, please skip pages so that your solutions stay in order. Good luck!

1. Evaluate and/or simplify each of the following expressions.

(a) (5 points) $\sin^{-1}(\sin(\pi))$

(b) (5 points) $\sec(\tan^{-1} x)$

(c) (5 points) $\frac{d}{dt} \sinh(\ln t)$

2. Evaluate each of the following limits.

(a) (8 points) $\lim_{x \rightarrow 0^+} \tan^{-1}(\ln x)$

(b) (8 points) $\lim_{x \rightarrow 0} \frac{x - \sin x}{x - \tan x}$

(c) (8 points) $\lim_{x \rightarrow \infty} x e^{-x}$

3. Evaluate each of the following integrals.

(a) (10 points) $\int \sec^3 x \tan^5 x \, dx$

(b) (10 points) $\int \frac{5x^2 - 5x + 12}{x^3 + 4x} \, dx$

(c) (10 points) $\int x^2 e^x \, dx$

(d) (10 points) $\int_{1/4}^{\sqrt{3}/4} \sqrt{1 - 4x^2} \, dx$

4. (10 points) Evaluate the improper integral if it converges. Otherwise, show that it diverges.

$$\int_1^{\infty} \frac{\ln x}{x^2} \, dx$$

5. Approximate the definite integral

$$\int_0^2 16^x \, dx$$

(a) (6 points) using the midpoint rule with $n = 4$ subintervals.

(b) (6 points) using Simpson's rule with $n = 4$ subintervals.