

Instructions:

PLEASE PROVIDE STEP BY STEP EXPLANATIONS

ANSWERS WITHOUT EXPLANATION WILL ONLY GET 40%

Time Limit 45 minutes

Please read the questions carefully before answering

It is recommended that you try those problems you are most comfortable with, first.

Attempt as many as you can; Anything over 100 is extra credit.

1. (10 pts) Evaluate  $\int \frac{\sin(\ln x) dx}{x}$
2. (15 pts). Evaluate  $\int x^2 \ln x dx$  using integration by parts.
3. (15 pts) Evaluate  $\int \sin^3 x \cos^2 x dx$
4. (15 pts) Evaluate  $\int \frac{dx}{\sqrt{x^2+4x}}$  Use completing the square and trigonometric substitution.
5. (15 pts) Evaluate  $\int \frac{dx}{x^3-16x}$  using partial fractions.
6. (15 pts) Find the area under the curve  $y = 1/\sqrt{x}$  from 0 to 1. Explain why this is an improper integral mathematically as well as using a graph.
7. (15 pts) Approximate  $\int_1^6 \frac{e^x dx}{x}$  using the trapezoidal method, and 5 intervals.
6. [Challenge problem, 20 points] Use a calculator to guess the value approached by  $(\frac{1}{n})^{1/n}$  as  $n$  goes to  $\infty$ . Then prove your answer by using calculus to find the limit.