

INSTRUCTIONS: Books, notes, and electronic devices are **not** permitted. Write (1) **your name**, (2) **1350/Final Exam**, (3) **lecture number/instructor name** and (4) **SUMMER 2015** on the front of your bluebook. Also make a **grading table** with room for 5 problems and a total score. **Start each problem on a new page.** Box your answers. A correct answer with incorrect or no supporting work may receive no credit, while an incorrect answer with relevant work may receive partial credit. **SHOW ALL WORK! JUSTIFY ALL YOUR ANSWERS!**

1. (15 pts) A farmer has 600 m of fencing with which she plans to enclose a rectangular divided pasture adjacent to a long existing wall. She plans to build one fence parallel to the wall, two to form the ends of the enclosure, and a fourth (parallel to the two ends of the enclosure) to divide it. What is the maximum area that she can enclose in this way?
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2. (a) (5 pts) The interval $[0, 3]$ is partitioned into n subintervals of equal length. Express the integral $\int_0^3 (3x^2 + 1)dx$ as the limit of a Riemann sum using the right-hand endpoints of each subinterval.
- (b) (5 pts) Given that $a < b$, what values of a and b minimize the value of $\int_a^b ((t^2 + t)(t^2 - 4t + 4))dt$?
- (c) (5 pts) Solve the initial value problem: $\frac{dy}{dx} = x^3 - x$ with $y(1) = -2$ [i.e., Solve for $y(x)$ and C].
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3. Evaluate the following:

- (a) (7 pts) $\frac{d}{dx} \int_1^{5^x} \frac{1}{\sqrt{1-t^2}} dt = ?$
- (b) (7 pts) $\int_0^{\sqrt{\ln \pi}} -\frac{1}{\sqrt{1-x^2}} dx = ?$
- (c) (7 pts) $\int \frac{\operatorname{sech} \sqrt{x} \tanh \sqrt{x}}{\sqrt{x}} dx$
- (d) (7 pts) $\int \sqrt{\cot x} \csc^2 x \, dx$
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4. Evaluate the following:

- (a) (8 pts) $\lim_{r \rightarrow 7} \sin^{-1}(\log_7 \sqrt{r})$
- (b) (8 pts) $\lim_{x \rightarrow \infty} x \tan(8/x)$
- (c) (8 pts) $\lim_{x \rightarrow 1^+} x^{1/(1-x)}$
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5. Let $f(x) = \frac{\cosh x}{e^x}$.

- (a) (4 pts) Simplify $f(x)$ using the definition of $\cosh x$.
- (b) (4 pts) Find the value of $f(\ln 3)$.
- (c) (5 pts) Is f increasing or decreasing at $x = \ln 3$?
- (d) (5 pts) Is f concave up or down at $x = \ln 3$?
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