- On the front of your blue book print (1) your name, (2) your student ID number, (3) your discussion section number, and (4) a grading table.
- Show all work in your blue book and BOX IN YOUR FINAL ANSWERS where appropriate.
- Please start each problem on a new page. There are a total of three problems on both sides of this paper and a total of 100 points.
- NO books, notes, crib sheets, calculators or any other electronic devices are allowed.

Show your reasoning clearly for all problems. A correct answer with no supporting work may receive no credit while an incorrect answer with some correct work may receive partial credit.

1. Solve the following unrelated problems.
   (a) (15 points) Evaluate $\lim_{x \to 0} x \ln(x)$.
   (b) (15 points) Find the average value of $g(x) = 1 + 2x$ over $[0, 2]$.
   (c) (10 points) f is an even function. Assume that $\int_{-2}^{5} f(x)\,\mathrm{d}x = 4$ and $\int_{-2}^{2} f(x)\,\mathrm{d}x = 10$. Find $\int_{0}^{5} f(x)\,\mathrm{d}x$.
2. Solve the following unrelated problems by writing down an expression for the quantity asked for. DO NOT EVALUATE.
   (a) (10 points) A Riemann sum to estimate the definite integral $\int_0^2 \sin(x^2)\,dx$ with $n = 4$ terms and using left endpoints.
   (b) (10 points) The exact area enclosed between $y = x^2$ and $y = x^3$.
   (c) (10 points) The median house price in California was 194.3 thousands of dollars in 1990. It is changing at a rate of $r(t)$ thousands of dollars per year, where t is measured in number of years since 1990. What is the median house price in 2006?
3. (30 points) A farmer has 120 meters of wire fence with which he plans to build two identical adjacent pens, as shown in picture. What is the maximum possible total area of these two pens?