MA 123 FINAL EXAM
THURSDAY, JUNE 26 6PM

Instructions: Please write all of your work and solutions in the blue book provided. Only work appearing in the blue book will be graded. Please show all work and write clearly in order to receive full/partial credit. This is a closed-book test. Calculators and any other electronic devices are *not* permitted. This is a 2 hour exam.

Problem 1: (20pts) Find the dimensions of the rectangle of largest area that has its base on the x-axis and its other two vertices above the x-axis and lying on the parabola $y = 5 - x^2$.

Problem 2: (20pts) Car A is heading due North along a straight road at a constant speed of 50 ft/s. Car B is heading due East along a straight road at a speed of 25 ft/s. The cars are 100 ft apart when Car B crosses the road on which Car A is traveling. How fast is the distance between the cars increasing 5 seconds later?

Problem 3: (20pts)

(a.) Approximate the value $\sqrt[3]{30}$ using two iterations of Newton's Method.
(b.) Compute the general antiderivative $\int (5-t)(2+t^3)\mathrm{d}t$.
(c.) Use the Trapezoidal Rule with $n = 4$ to approximate $\int_0^1 x^2 \mathrm{d}x$.

Problem 4: (20pts)

(a.) Compute the general antiderivative $\int x e^{-x^2} \mathrm{d}x$.
(b.) Compute $\int_1^\pi e^x \sin x \ \mathrm{d}x$.

Problem 5: (20pts) Suppose the velocity function $v(t) = 5\cos(2\pi t)$ is given for a particle moving along a straight line. Assume time starts at $t = 0$.

(a.) Find the displacement of the particle from its initial position after 1 time unit.
(b.) Find the total distance traversed by the particle after 1 time unit.