Place all books and papers under your desk. You may use a 3×5 card of notes which you should turn in with your blue book. Write your name and section on your blue book. On the front of your book in a column number one to five. Box your answers and show all your work. Good Luck!

1. 20 pts. Set up the integral of $f(x, y) = xy$ over the following 4 regions. You may use Cartesian or polar coordinates. Do **NOT** compute the integral.

2. (a) 10 pts. Compute $\int_0^2 \int_{x^2}^{2x} (4x + 2) dy dx$.

   (b) 10 pts. Sketch the region of integration and reverse the order of integration.

3. 20 pts. Compute $\iiint_E xy dV$ where E is the tetrahedron with vertices $(0, 0, 0)$ $(1, 0, 0)$ $(0, 2, 0)$ and $(0, 0, 3)$.

4. 20 pts.
   (a) Compute the MacLaurin Series for e^x.

   (b) Use (a) to find the MacLaurin Series for $x^4 e^{x^2}$.

   (c) Use (b) to find the 12th derivative of $x^4 e^{x^2}$ at zero.

   (d) What is the value of x if $\sum_{n=1}^{\infty} \frac{1}{(1+x)^n} = 10$?

5. (a) 10 pts. Solve the initial value problem

$$xy' + 2y = e^{x^2}, \quad y(1) = 0.$$

   (b) 15 pts. Find the general solution to $y'' - y' - 6y = 0$.

   (c) 15 pts. Find the general solution to $y'' - y' - 6y = e^{3x}$.