Name: _____

4-digit code: _____

- Write your name and the last 4 digits of your SSN in the space provided above.
- The test has three (3) pages, including this one.
- The test is fifty (50) minutes long.
- Enter your answer in the box(es) provided.
- You must show sufficient work to justify all answers unless otherwise stated in the problem. Correct answers with inconsistent work may not be given credit.
- Credit for each problem is given in parentheses at the right of the problem number.
- No books, notes or calculators may be used on this test.

Page	**Max. points**	**Your points**
2	50	
3	50	
Total	100	

Problem 1 (25 pts)**.** Calculate the double integral $\iint_R \frac{1+x^2}{1+y^2}\,dA$, for the rectangle $R = [0,1] \times [0,1]$.

Problem 2 (25 pts)**.** Use a double integral to compute the volume under the surface $z = xy$ and above the region bounded by $x = y^2$ and $x = y^3$.

Problem 3 (25 pts)**.** Evaluate $\iint_R (3x + 4y^2)\, dA$, where R is the region in the upper half-plane bounded by the circles $x^2 + y^2 = 1$ and $x^2 + y^2 = 4$.

Problem 4 (25 pts)**.** A rectangular box without a lid is to be made from $12\,\mathrm{m}^2$ of cardboard. We want to find the maximum volume of such a box.

We model the box to have length x, width y and height z. That way, the volume can be expressed by the formula $V = xyz$. We need to find the maximum value of the function $V(x, y, z) = xyz$, with a constraint on the variables: $xy + 2yz + 2zx = 12$. Use Lagrange multipliers to solve this problem.