1. Find the absolute max and min for
   \[ f(x,y) = x^2 + y^2 + xy + 4 \] in \([-1,1] \times [-1,1]\]

2. Use the method of Lagrange multipliers to find
   the extreme values of
   \[ f(x,y) = x^2 + 2y^2 \] on the
   circle \( x^2 + y^2 = 1 \).

3. Estimate the volume below \( z = xy \) and above the
   rectangle \( D = \{0,5\} \times [0,4] \) by dividing the
   \( x \)-interval into 4 points, the \( y \)-interval into 3 points,
   and taking as height the value of \( f(x,y) \) at
   each upper-right corner. Compare your answer
   with
   \[ \iint_D xy \, dA \]

4. Evaluate
   \[ \iint_R 5-x \, dA \quad R = [0.5] \times [0.5] \]
   both algebraically and geometrically.
5) Use Fubini's Theorem to compute:

a) \( \int_{0}^{3} \int_{0}^{1} (1 + 4xy) \, dx \, dy \)

b) \( \int_{0}^{2} \int_{0}^{1} 4x^3 - 8x^2y \, dy \, dx \)

c) \( \int_{0}^{1} \int_{0}^{1} xy \sqrt{x^2 + y^2} \, dy \, dx \)

d) \( \int_{0}^{1} \int_{0}^{1} \sqrt{s + t^2} \, ds \, dt \)

e) \( \int \int_{R} \frac{1 + x^2}{1 + y^2} \, dA, \quad R = [0, 1] \times [0, 1] \)

f) \( \int \int_{R} \frac{x}{x^2 + y^2} \, dA, \quad R = [1, 2] \times [0, 1] \)

(6) Find the volume under \( \zeta = 4 + x^2 - y^2 \) and above \( R = [-1, 1] \times [0, 2] \)

(7) Find the volume of the solid enclosed by \( \zeta = t \, e^x \, \sin(y) \) and the planes \( x = \pm 1, \, y = 0, \, \gamma = y \), and \( \zeta = -t \).
Read Fubini’s Theorem carefully. Then use Maple to compute

\[ \int_0^1 \int_0^1 \frac{x-y}{(x+y)^3} \, dy \, dx \quad \text{and} \quad \int_0^1 \int_0^1 \frac{x^2-y^2}{(x+y)^3} \, dx \, dy. \]

Explain.