Iterated Partial Derivatives

1. Let \( f(x, y) = 2xy + 2y^2 + y - 5x^2 \). Find \( \nabla f \) (we computed this on a previous worksheet).

2. Let \( f(x, y) = 2xy + 2y^2 + y - 5x^2 \) (as above). Use your answer to the previous question to compute \( f_{xy}, f_{xx}, \) and \( f_{yy} \).

3. Let \( h(x, y) = \left( \frac{yx^2 + 1}{2y^2 x} \right) \). Find \( \mathbf{D} h(x, y) \) (we computed this on a previous worksheet).

4. Given \( h(x, y) = \left( \frac{yx^2 + 1}{2y^2 x} \right) \) (as above). Use your answer from the previous question to compute the derivatives with respect to all the entries of \( \mathbf{D} h(x, y) \).
Double Integrals

5. Let $f(x, y) = x^2y^2$. Integrate $f(x, y)$ over the unit square $R = [0, 1] \times [0, 1]$.

6. For the same $f$ as in the previous example, integrate over the triangle bounded by the $x$-axis, $y$-axis and the line $y = -x + 1$.

7. Let $g(x, y) = \sin x + y^2$. Integrate $g(x, y)$ over the rectangle $R = [0, \pi] \times [0, 1]$. 