(1) Let \( z = 2x^3 + xy^2 + 5x^2 + y^2 \). Find the critical points of this function.

   Answer: \((0, 0), (-5/3, 0), (-1, \pm 2)\).

(2) Find and classify the critical points of \( x^3 + y^3 - 3xy \).

   Answer: saddle point at \((0, 0)\), minimum at \((1, 1)\).

(3) Find the greatest and least value of the function \( z = x^2 + 2xy - 4x + 8y \) in the rectangle \([0, 1] \times [0, 2]\).

   Answer: greatest value is \( z = 17 \), achieved at \((1, 2)\). The least value is \( z = -3 \) at \((1, 0)\). The critical point \((-4, 6)\) lies outside the rectangle and is discarded.

(4) Find the greatest and least value of the function \( z = e^{-x^2-y^2}(2x^2 + 3y^2) \) on the disk \( x^2 + y^2 \leq 4 \).

   Answer: maximum of \(3/e\) at \((0, \pm 1)\), minimum of 0 at \((0, 0)\).

(5) Find the maximum and minimum of the function \( 2x^2 + xy^2 + y^3 \) on the triangle whose vertices are \((-1, 1), (1, 1)\) and \((0, 3)\).

   Answer: The function has two critical points outside the triangle. The maximum is 27, achieved at \((0, 3)\), and the minimum is 7/8, achieved at \((-1/4, 1)\).