Math 233 - Final Exam A   Name _____
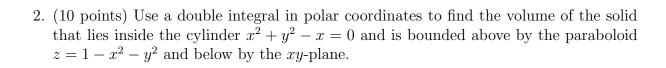
Show all work to receive full credit. Supply explanations where necessary. This portion of the test is due December 11. You must work individually. All integration must be done by hand, but you may use technology to check your answers.

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1. (10 points) Let $f(x, y) = 2xy^2 - x^2y + 4xy$. Determine all relative maxima, relative minima, and saddle points.

2. (10 points) Use a double integral in polar coordinates to find the volume of the solid that lies inside the cylinder $x^2 + y^2 - x = 0$ and is bounded above by the paraboloid $z = 1 - x^2 - y^2$ and below by the xy-plane.

3. (10 points) The base of a triangular prism lies in the xy-plane bounded by the graphs of $y = 0$, $x = 0$, and $y = 1 - x$. The top of the prism lies in the plane $2x + y + z = 4$. The density of the prism at the point (x, y, z) is given by $\rho(x, y, z) = x + 2$. Use a triple integral to find the mass of the prism.