Homework Section 14.8

1. Use Lagrange Multipliers to find the extreme values of the function under the given constraint(s).

   a) $f(x, y) = y^2 - x^2$; $\quad x^2 + y^2 = 1$

   b) $f(x, y) = xy^2$; $\quad 2x^2 + y^2 = 6$

   c) $f(x, y, z) = 2x + 6y + 14z$; $\quad x^2 + y^2 + z^2 = 59$

   d) $f(x, y, z) = xyz$; $\quad 3x^2 + y^2 + 4z^2 = 9$

   e) $f(x, y, z) = x^4 + y^4 + z^4$; $\quad x^2 + y^2 + z^2 = 12$

   f) $f(x, y, z) = x^2 + y^2 + z^2$; $y - z = 1$, $x^2 + y^2 = 1$

   g) $f(x, y, z) = 2x + y + z$; $\quad x + y - z = 2$, $\quad x^2 + z^2 = 5$

2. Find the absolute extrema of $f(x, y) = e^{xy}$ on the set $R = \{(x, y) \mid 9x^2 + y^2 \le 1\}$. Use Lagrange Multipliers on the boundary and the method of section 14.7 on the interior.

3. Use Lagrange Multipliers to locate the points on the surface $y^2 = xz + 2$ that are closest to the origin.

4. To hold all your math awards, you need a cardboard box with volume of 28,000 cubic centimeters and no lid. But cardboard is expensive, and you're not made of money, so you decide to use as little cardboard as possible. Use Lagrange Multipliers to find the dimensions that minimize the amount of cardboard used.