1. For the following functions find the critical points and classify them as local maxima, local minima, saddle points, or none of these

   (a) $f(x,y) = x^2 - 2xy + 3y^2 - 8y$
   (b) $f(x,y) = 400 - 3x^2 - 4x + 2xy - 5y^2 + 48y$
   (c) $f(x,y) = x^3 + y^2 - 3x^2 + 10y + 6$
   (d) $f(x,y) = x^3 - 3x + y^3 - 3y$
   (e) $f(x,y) = x^3 + y^3 - 3x^2 - 3y + 10$
   (f) $f(x,y) = x^3 + y^3 - 6y^2 - 3x + 9$
   (g) $f(x,y) = (x+y)(xy+1)$
   (h) $f(x,y) = 8xy - \frac{1}{4}(x+y)^4$
   (i) $f(x,y) = 5 + 6x - x^2 + xy - y^2$
   (j) $f(x,y) = e^{2x^2+y^2}$

2. For the following functions find global maxima or minima.

   (a) $f(x,y) = x^2 - y^2 + 2$ in disc $x^2 + y^2 \leq 1$,
   (b) $f(x,y) = 2x^3 + 4x^2 + y^2 - 2xy$ in closed area between the curves $y = x^2$ i $y = 4$,
   (c) $f(x,y) = x^3 + y^3 - 9xy + 27$ in square $0 \leq x \leq 4, \quad 0 \leq y \leq 4$,
   (d) $f(x,y) = x^2y - 8x - 4y$ in triangle with vertex $(0,0), (0,4), (4,0)$.

3. Do the following functions have global maxima or minima?

   (a) $f(x,y) = x^2 - 2y^2$
   (b) $f(x,y) = x^2y^2$
   (c) $f(x,y) = x^3 + y^3$
   (d) $f(x,y) = -2x^2 - 7y^2$
   (e) $f(x,y) = \frac{x^2}{2} + 3y^3 + 9y^2 - 3x$