Exercises:

1. Indicate domain definition of each function below graphically
   a. $\ln\left(\sqrt{x^2 + y^2 - 16}\right)$

   b. $\dfrac{x}{x^2 + y^2 - 4}$

2. Investigate the value of A such that f continuous at $(0,0)$

$$f(x, y) = \begin{cases} \frac{x^2 - y^2}{x^2 + y^2}, & (x,y) \neq (0,0) \\ A, & (x,y) = (0,0) \end{cases}$$

3. If $U = x^3 y$, find $\dfrac{dU}{dt}$ if $x^5 + y = t$ and $x^2 + y^3 = t^2$.

4. If $z = f(x, y) = x^2 y - 3y$, then
   a. find dz
   b. determine dz if $x = 4, y = 3, \Delta x = -0,01, \Delta y = 0,02$
   c. how might you determine $f(5,21;6,85)$ without direct computation?

5. Find the directional derivative of $f(x, y, z) = x^2 yz^3$ in the direction $-i + 2j + k$ at the point (1,1,-1)

6. Find critical points of function $f(x, y) = x^3 + y^3 - 3x - 12y + 20$, then determine as max or min point.

7. Find the maxima and minima of $f(x, y, z) = xy^2 z^3$ subject to the conditions $x + y + z = 6, x > 0, y > 0, z > 0$