1. Decide if the following function is continuous in point [0; 0]:
$$f(x,y) = \begin{cases} \frac{\sin(x^2+y^2)}{\sqrt{x^2+y^2+1}-1} & \text{for} \quad [x,y] \in \mathcal{D}(f) \\ 2 & \text{for} \quad [x,y] = [0;0] \end{cases}$$

Derivatives with parameters

2. Compute the derivative of the function $f(x) = \frac{1}{\tan\left(\frac{a}{x}\right)}$, where $a \in \mathbb{R}$ is a parameter.

3. a) Compute the derivative of the function $f(x) = \frac{1}{\sqrt{x^2+a^2+b^2}}$, where $a, b \in \mathbb{R}$ are parameters.
   b) Where is the function increasing?

4. a) Compute the derivative of the function $f(y) = a^2 + a(\sin y - y^4)$, where $a \in \mathbb{R}$ is a parameter.
   b) Decide if the function is decreasing or increasing in the neighborhood of point $y_0 = 0$.

5. Compute the derivative of the function $f(y) = ae^{ay^2} + b^5 y^{-4}$, where $a, b \in \mathbb{R}$ are parameters.

Partial derivatives

6. Find a domain of definition of following functions (and sketch it), compute all partial derivatives:
   (a) $f(x,y) = \sqrt{2x-y}$
   (b) $f(x,y) = x^2 + y^3 - 2y^2 - 4xy$
   (c) $f(x,y) = xe^y + x^2 - 2y^2 - 2$
   (d) $f(x,y) = \ln(x - y^2)$
   (e) $f(x,y) = 3\cos(4y)\sin(x) - \sin(2x)$
   (f) $f(x,y) = \sqrt{xy}$
   (g) $f(x,y) = \ln(9 - x^2 - 9y^2)$
   (h) $f(x,y) = x^y$
   (i) $f(x,y,z) = \sqrt{x} + \sqrt{y} + \sqrt{z}$
   (j) $f(x,y,z) = xz - 5x^2y^3z^4$

7. To given function $f(x,y,z,t) = x^2 y \cos(\frac{z}{t})$ find the $\frac{\partial f}{\partial t}$.

8. Compute all partial derivatives of $f(x,y,z) = x\sin(y-z)$ in a point $A = [1;0;0]$. What does these values mean?

9. Compute all partial derivatives of $f(x,y,z) = ze^{xyz}$ in a point $A = [0;2;-1]$. What does these values mean?

10. a) Compute all partial derivatives of $f(x,y) = \ln(2x-y) + 3x^3 - xy$ in a point $A = [1;1]$.
    b) Write a tangent line of the function in a cut $x \equiv 1$ in tangent point A.