1 Samples

Sample 1

- Compute
$$\lim_{x\to 1+} \sqrt{x^2-1}\log(x-1)$$
- Use the third-degree Taylor polynomial to approximate the value of $e^{-0.3}$.
- Find and sketch the domain of
$$f(x,y) = \frac{\sqrt{x}}{1-\sqrt{x^2-y^2}}.$$
- Let f be given as
$$f(x,y) = x^2 + xye^{2y}.$$
Compute ∇f and $\nabla^2 f$.
- Write the second-degree Taylor polynomial for $f(x,y) = x^2 \sin y$ at the point $(2,0)$.

Sample 2

- Compute
$$\lim_{x\to\infty} x^{-3}e^x.$$
- Decide, whether
$$A = \{(x,y) \in \mathbb{R}^2,\ x^2 + 2x - y > 0,\ x - y > 1\}$$
is closed or open and justify your answer. Sketch the set.
- Examine
$$\lim_{(x,y)\to(0,0)} \frac{xy-y^2}{x^2+y^2}.$$
- Let $f(x,y) = \frac{2x-y}{x^2+y^2+1}$. Compute ∇f and $\nabla^2 f$.
- Use the second-degree Taylor polynomial to find the approximate value of $\sqrt{3.2^2 + 3.9^2}$.

Sample 3

- Write the fourth-degree polynomial at $x_0 = 0$ of $f(x) = x^2(1+e^x)$.
- Find and sketch the boundary of
$$A = \{(x,y) \in \mathbb{R}^2,\ x^2 \geq 1,\ y < -1,\ x^2 + y^2 < 16\}.$$
- Sketch the countour lines of $f(x,y) = \log(x^2 + 4y^2)$ at heights $z_0 = -1,\ 0,\ 1$.
- Compute the derivative of $f(x,y) = x^2 + 2(x-y^2)$ at the point $(1,1)$ in direction $\left(\frac{\sqrt{3}}{2},\ \frac{1}{2}\right)$.
- Write the equation of a plane tangent to a graph of $f(x,y) = x^2 + \sqrt{5+y^2}$ at point $(x_0,y_0) = (1,2)$.