1) Find domain of definition:

a) $z = \ln(y^2 - 4x + 8)$

b) $z = \sqrt{9 - x^2 - y^2}$

c) $z = \dfrac{\sqrt{4x - y^2}}{\ln(1 - x^2 - y^2)}$

d) $z = \sqrt{x \cdot \sin y}$

2) Find partial derivatives:

a) $z = x\sqrt{y} + \dfrac{y}{\sqrt{x}}$

b) $z = x^y$

c) $z = x^2y + y^2x + \ln y - e^x + 5$

d) $u = (x)^{y \cdot z}$

e) $e^z - xyz = 0$

3) $z = \dfrac{y}{f(x^2 - y^2)}$, where f is any differentiable function.

Prove, that $\frac{1}{x} \cdot z'_x + \frac{1}{y} \cdot z'_y = \frac{z}{y^2}$.

4) Find all partial derivatives of the second order.

$z = x^3 + xy^2 - 5xy^3 + y^5$

5) Find total differential of u if $u = x^2 \cdot y + 3\sin(2x + 5y) + x^3$.

6) Find total differential of function $\ln(x + 2y + 3z)$ at point $M_0(1, 2, 0)$.

7) Calculate approximatly:

a) $\ln(\sqrt[3]{1{,}03} + \sqrt[4]{0{,}98} - 1)$

b) $(1{,}04)^{2{,}02}$.