1) [illegible] the domain of

$$f(x,y) = \frac{\ln(y - x - 1)}{\sqrt{x + y - 4}}$$

sketch it on the xy plane.

2) Let $f(x,y) = \sqrt{4x^2 + y^2}$.
Sketch the level curves $f(x,y) = L$ for $L = \frac{1}{2}, 1, \frac{3}{2}, 2$.

3) Sketch

a) $z = \ln(y)$

b) $z = 2 + x^2 + y^2$

c) $z = \sqrt{x^2 + 4y^2}$

4) Find the limit. If it does not exist, show that at least two paths exist with contradicting limits. Prove that it exists otherwise.

a) $\lim_{(x,y)\to(0,0)} y \sin(x + y)$

b) $\lim_{(x,y)\to(0,0)} \frac{x^2y^2}{x^3 + y^6}$

c) $\lim_{(x,y)\to(1,0)} \frac{xy - y}{(x-1)^2 + y^2}$

5) Where is $f(x,y) = \frac{e^x + e^y}{e^{xy} - 1}$ continuous?

6) Let $f(x,y) = \begin{cases} \frac{x^2y^3}{2x^2 + y^2} ; & (x,y) \neq (0,0) \\ 1 ; & (x,y) = (0,0) \end{cases}$

Is $f(x,y)$ continuous at $(0,0)$

7) Compute $f_x, f_y, f_{xx}, f_{yy}, f_{xy}$, and f_{yx}

a) $f(x,y) = x^4y^3 + 8x^2y$

b) $f(x,y) = e^{-x}\cos(\pi y)$

c) $f(x,y) = \frac{x}{(x+y)^2}$

d) $f(x,y) = \int_y^x \cos(e^t)\,dt$

8) Let $f(x,y) = \frac{x}{x+y}$

a) Find the equation of the pl[ane] tangent to $f(x,y)$ at $(2,1)$

b) Use this plane to approximate $f(2.1, 1.2)$ and compare with the actual value.

9) Compute $\frac{\partial z}{\partial x}$:

$$xy - z^2 = z\sin(x^2 + y^2)$$

10) If $z = 5x^2 + y^2$ and (x,y) c[hanges] from $(1,2)$ to $(1.05, 2.1)$ co[mpare] Δz and dz.

11) Consider $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

Compute dR