Quiz 7 Valentina Lisitsa is going to give a piano concert in San Francisco on July 8.

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Problem 1 (5 points): Find a parametrization for the line in which the planes

$$3x - 6y - 2z = 3 \quad \text{and} \quad 2x + y - 2z = 2$$

intersect.

First, $(1,0,0)$ satisfies $\begin{cases} 3x-6y-2z=3 \\ 2x+y-2z=2 \end{cases}$, then $(1,0,0)$ is on the line

A plane $Ax+By+Cz=D$ has normal vector (A,B,C)

so $3x-6y-2z=3$ has normal vector $(3,-6,-2)$

$2x+y-2z=2$'s normal vector is $(2,1,-2)$

Then a directional vector of the line which is the intersection of these two planes is $(3,-6,-2)\times(2,1,-2) = \begin{vmatrix} i & j & k \\ 3 & -6 & -2 \\ 2 & 1 & -2 \end{vmatrix} = (14,2,15)$

Then the line is $(1,0,0) + t(14,2,15)$;

or $\begin{cases} x = 1+14t \\ y = 2t \\ z = 15t \end{cases}$

Problem 2 (5 points): Find the function $f(x,y) = \sqrt{y-x}$ domain and range and describe its level curve.

$f(x,y) = \sqrt{y-x} \Rightarrow y-x \geq 0 \Rightarrow f(x,y) \geq 0$

(i) The domain is $\{(x,y) \mid y-x \geq 0\}$.

The range is $[0, +\infty)$

(ii) for $f(x,y) = z_0$, $\sqrt{y-x} = z_0 \Rightarrow y-x = z_0^2$

so $y = x + z_0^2$

Then the level curve at the level $z = z_0$ is

$$\begin{cases} y = x + z_0^2 \\ z = z_0 \end{cases}$$