Question 1. If the restriction of $f(x, y)$, where $(x, y) \in \mathbb{R}^2$, to each line in the plane is continuous, is f necessarily continuous?

Question 2.

Prove: $\frac{\pi^2}{\sin^2 \pi z} = \Sigma_{n=-\infty}^{\infty} \frac{1}{(z-n)^2}$.

Question 3.

Let $D = \{(x, y) : x^2 + y^2 < 1\}$. Solve the equation

$$\begin{cases} \Delta u &= \dfrac{\cos(xy)}{\sqrt{x^2+y^2}} \text{ in } D \\ u &= 0 \text{ on } \partial D, \end{cases}$$

Explain in what sense the equation holds and indicate where the equation holds in the classical sense.