

Suppose

$$U = X - \sqrt{X^2 - Y} \text{ and } V = X + \sqrt{X^2 - Y}.$$

Then

$$X = \frac{1}{2}(U + V) \text{ and } Y = UV$$

(as you can easily verify). Now suppose these are all random variables, and suppose that the joint distribution function of X and Y is $f_{X,Y}(x, y)$. Express $f_{U,V}(u, v)$ as a function of u and v . (The answer will involve $f_{X,Y}$ evaluated at $(\frac{1}{2}(u + v), uv)$.)