Check the canonicity of coordinate transformations

(a) The relations \( q = P \cos Q, \ p = P \sin Q \) describe a transformation between Cartesian coordinates and polar coordinates in the phase space of a system with one degree of freedom. Determine whether this transformation is canonical or not. (b) Determine the values of the parameters \( \alpha, \beta \) the linear transformation \( Q = q + \alpha p, \ P = p + \beta q \) is canonical. (c) Verify that the transformation \( Q = \sqrt{p - t^2}, \ P = -2q\sqrt{p - t^2} \) to be used in \[mex83\] is canonical.

Solution: