

[mex90] Determine canonicity and generating functions II

Consider the following transformation from a set of canonical coordinates (q, p) to a new set of coordinates (Q, P) :

$$Q = \frac{1}{2}(q^2 + p^2), \quad P = -\arctan \frac{q}{p}.$$

(a) Verify that this transformation is canonical by investigating its Jacobian determinant. (b) Determine the generating function $F_4(p, P)$ by integration of the total differential dF_4 . (c) Determine the generating function $F_1(q, Q)$ from $F_4(p, P)$.

Solution: