EXACT SOLUTIONS OF VARIABLE-ARC-LENGTH ELASTICAS
UNDER MOMENT GRADIENT

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This paper deals with the bending problem of a variable-arc-length elastica under moment gradient. The variable arc-length arises from the fact that one end of the elastica is hinged while the other end portion is allowed to slide on a frictionless support that is fixed at a given horizontal distance from the hinged end. Based on the elastica theory, exact closed-form solution in the form of elliptic integrals are derived. The bending results show that there exists a maximum or a critical moment for given moment gradient parameters: whereby if the applied moment is less than this critical value, two equilibrium configurations are possible. One of them is stable while the other is unstable because a small disturbance will lead to beam motion.