2. Consider a Cable Of Unspecified Length Which Is Connected Between Two Fixed Points In the $x-z$ Coordinate System, At $(x,z)=(0,1)$ And (x_0,z_0), Where x Is a Horizontal Coordinate And z Is a Vertical Coordinate, Which Has a Mass Density Per Unit Length Of ρ, and is In a Gravitational Field Which Points In the Negative $\hat{\mathbf{z}}$ Direction, With Gravitational Constant g. The Objective Is To Determine the Specific Shape Of the Cable In a 2D Sense, That Is, To Find $z(x)$ Which Minimizes the Potential Energy, U, Of the Cable. Recall That the Differential Potential Energy (With Reference To $U=0$ At $z=0$) Of a Differential Mass Element, dm, Is Given By $dU=glzdm$, Which Can Be Related To a Differential Length (Along the Cable) Element, ds, Where $dm=\rho lds$, So That the Total Potential Energy Of the Cable Can Be Obtained As An Integral Along the Length Of the Cable, From the Point At $x=0$ To the Point At $x=x_0$, Or $U=\rho gl^2\int\limits_{x=0}^{x=x_0} zds=\int\limits_{0}^{x_0} f(z,z_x,x)\,dx$. Here, It Should Be Noted That All Length Variables, x,z, Are Dimensionless, And Normalized With Respect To a Characteristic (Dimensional) Length, l. Also, Recall That the Extremum Of the Potential Energy Functional, $\delta U=0$, Can Be Satisfied By the Solution Of the Euler Equation, $\frac{\partial f}{\partial z}-\frac{d}{dx}\left(\frac{\partial f}{\partial z_x}\right)=0$, And If the Integrand Of the Functional Is Independent Of x, That Is, Of the Form $f(z,z_x)$, the Alternate Version Of the Euler Equation, $f-z_x\frac{\partial f}{\partial z_x}=K$, Can Be Used, Where the Constant