Express the 2nd order ODE

as a system of 1st order ODEs and verify that there exists a global solution by invoking the global existence and uniqueness Theorem.

Useful information:

Global existence and uniqueness Theorem:

The ordinary differential equation

has a unique solution if , f is continuous with respect to 1st variable and Lipschitz with respect to 2nd variable.

Lipschitz Continuity: A function is Lipschitz continuous if such that  
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NB: means vector value.