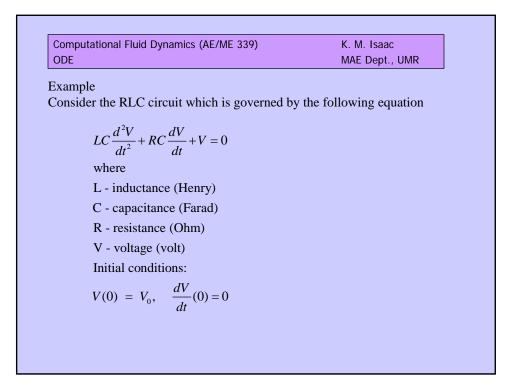


DE	MAE Dept., UMR
R-K Method	
Equation governing 2D jet flow	
$\frac{d^3f}{d\eta^3} + f\frac{d^2f}{d\eta^2} + \left(\frac{df}{d\eta}\right)^2 = 0$ Numerical solution can be obtained using Re-	unge-Kutta method.
Outline: 1. Rewrite the above as three first order equ	ations
2. Cast as an initial-value problem.	
3. Solve using Runge-Kutta	

Computational Fluid Dynamics (AE/ME 339)K. M. Isaac  
MAE Dept., UMRDefine
$$\frac{df}{d\eta} = \xi, \quad \frac{d\xi}{d\eta} = \zeta$$
The 3 first-order equations become $\frac{df}{d\eta} = \xi$  $\frac{d\xi}{d\eta} = \zeta$  $\frac{d\xi}{d\eta} = -f\zeta + \xi^2$ 

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Boundary Conditions:	
at $\eta=0$ :	
$f = 0,  \zeta = 0$	
at $\eta = \infty$ :	
$\xi = 0$	
The above is a boundary-value problem. In such as R-K, the problem must be recast as Instead of applying the third BC directly, so different values of $\xi$ at $\eta = 0$ . The correct solution is the one that satisfies	an I-V problem. Iution is obtained for



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Rewrite the circuit equation as	
$LC \frac{d^2 V}{dt^2} = -RC \frac{dV}{dt} - V$	
The above second-order equation can be wri	tten as the two
ollowing first-order equations:	
$Y_1 = V,  Y_2 = \frac{dV}{dt}$	
$F_1 = \frac{dY_1}{dt} = \frac{dV}{dt} = Y_2,  F_2 = \frac{dY_2}{dt} = \frac{d^2V}{dt^2} = -\frac{R}{L}$	$\frac{dV}{dt} - \frac{1}{LC}V = -\frac{R}{L}Y_2 - \frac{1}{LC}Y_1$
with following initial conditions: $Y_{1,0} = V_0$ , $Y_{2,0} = 0$	

