métodos simplecticos

1. Resolver analíticamente la ecuación diferencial no lineal

$$\frac{du}{dt} = u^q \quad , t \in [0, 10]$$

$q = 1 \rightarrow u(t) = e^t$

$q < 1 \rightarrow u(t) = (t(1-q)+1)^{\frac{1}{1-q}}$ y $t(1-q)+1 > 0$

Cuando $q = 1$

$$\frac{du}{dt} = u^{(1)} \rightarrow \int \frac{du}{u} = \int dt$$

$$\ln(u) = t + C_1 ;$$

$$u = e^t + A \quad , e^{C_1} = A$$

$$u(t) = e^t \checkmark$$

Cuando $q < 1$

$z = u^q$

$\frac{dz}{dt} = (1-q)$

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$z = \int \frac{dz}{dt}$

$(1-q)t + C = z$

$[(1-q)t + C]^{\frac{1}{1-q}} = u$; $C = 1$ ya que $t(1-q)+1^{C} > 0$

$u(t) = [(t(1-q))+1]^{\frac{1}{1-q}}$ ✓