DE

- $Y' + \alpha Y = Y(t)$; $Y(0) = A$
- $Y'' + \alpha Y' + \beta Y = Y(t)$; $Y(0) = A,\ Y'(0) = B$
- $Y''' + \alpha Y'' + \beta Y' + \gamma = Y(t)$: $Y(0) = A,\ Y'(0) = B,\ Y''(0) = C$
- $Y^{(IV)} + \alpha Y''' + \beta Y'' + \gamma Y' + \partial = Y(t)$: $Y(0) = A,\ Y'(0) = B,\ Y''(0) = C,\ Y'''(0) = D$

Introduce Laplace:

$$\mathcal{L}\{Y^{(n)}\} = s^n \mathcal{L}\{Y\} - s^{n-1} Y(0) - s^{n-2} Y'(0) - s^{n-3} Y''(0) - s^{n-4} Y'''(0) \cdots - s^1 Y^{(n-2)}(0) - s^0 Y^{(n-1)}(0).$$

$$\mathcal{L}\{Y^{(IV)}\} = s^4 \mathcal{L}\{Y\} - s^3 Y(0) - s^2 Y'(0) - s^1 Y''(0) - s^0 Y'''(0)$$

$$\mathcal{L}\{Y'''\} = s^3 \mathcal{L}\{Y\} - s^2 Y(0) - s^1 Y'(0) - s^0 Y''(0)$$

$$\mathcal{L}\{Y''\} = s^2 \mathcal{L}\{Y\} - s^1 Y(0) - s^0 Y'(0)$$

$$\mathcal{L}\{Y'\} = s^1 \mathcal{L}\{Y\} - s^0 Y(0)$$

$$\mathcal{L}\{Y\} = s^0 \mathcal{L}\{Y\} = 1 \cdot y = y$$

$$\mathcal{L}\{F(t)\} = f(s)$$

$$\mathcal{L}\{Y(t)\} = y(s)$$

$$\mathcal{L}\{Y\} = y$$