Parte final de Transformada de Laplace

$n \times n$

$$\frac{d}{dt}\bar{x} = A\bar{x} \longrightarrow \bar{x} = e^{At}\bar{x}(0)$$

$$\mathcal{L}\left\{\frac{d}{dt}\bar{x}\right\} = A\mathcal{L}\{\bar{x}\}$$

$$s\bar{X}(s) - \bar{x}(0) = A\bar{X}(s)$$

$$s\bar{X}(s) - A\bar{X}(s) = \bar{x}(0)$$

$$(sI - A)\bar{X}(s) = \bar{x}(0)$$

$$\bar{X}(s) = (sI-A)^{-1}\bar{x}(0)$$

$$\mathcal{L}^{-1}\{\bar{X}(s)\} = \mathcal{L}^{-1}\{(sI-A)^{-1}\bar{x}(0)\}$$

$$\bar{x}(t) = \mathcal{L}^{-1}\{(sI-A)^{-1}\}\bar{x}(0)$$

$$e^{At} = \mathcal{L}^{-1}\left\{ (sI - A)^{-1} \right\} \quad s \leftarrow t$$

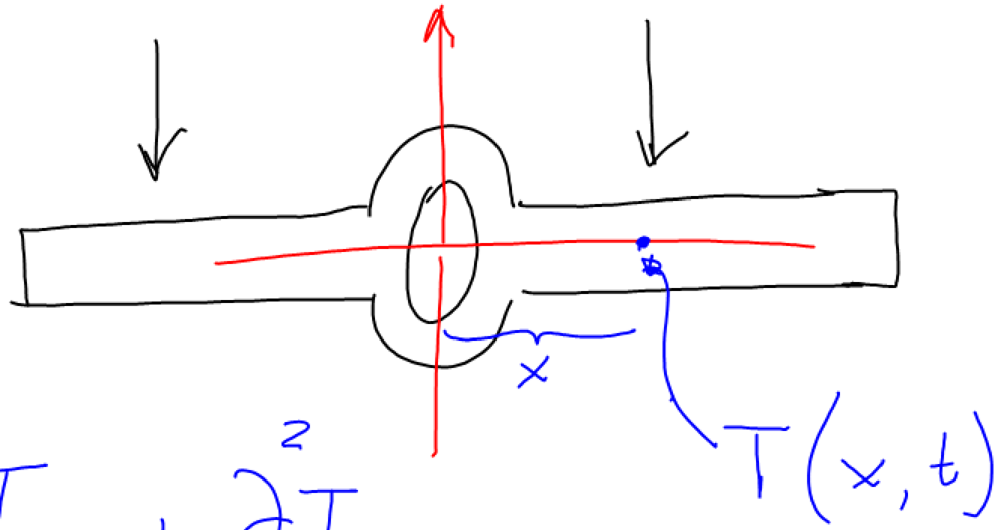
$$\left.\begin{aligned} \frac{dx_1}{dt} &= 3x_1 + 4x_2 \\ \frac{dx_2}{dt} &= 2x_1 + 5x_2 \end{aligned}\right\} \; ; \; \left| \begin{aligned} x_1(0) &= 5 \\ x_2(0) &= -5 \end{aligned} \right.$$

$$A = \begin{bmatrix} 3 & 4 \\ 2 & 5 \end{bmatrix} \qquad \bar{x}(0) = \begin{bmatrix} 5 \\ -5 \end{bmatrix}$$

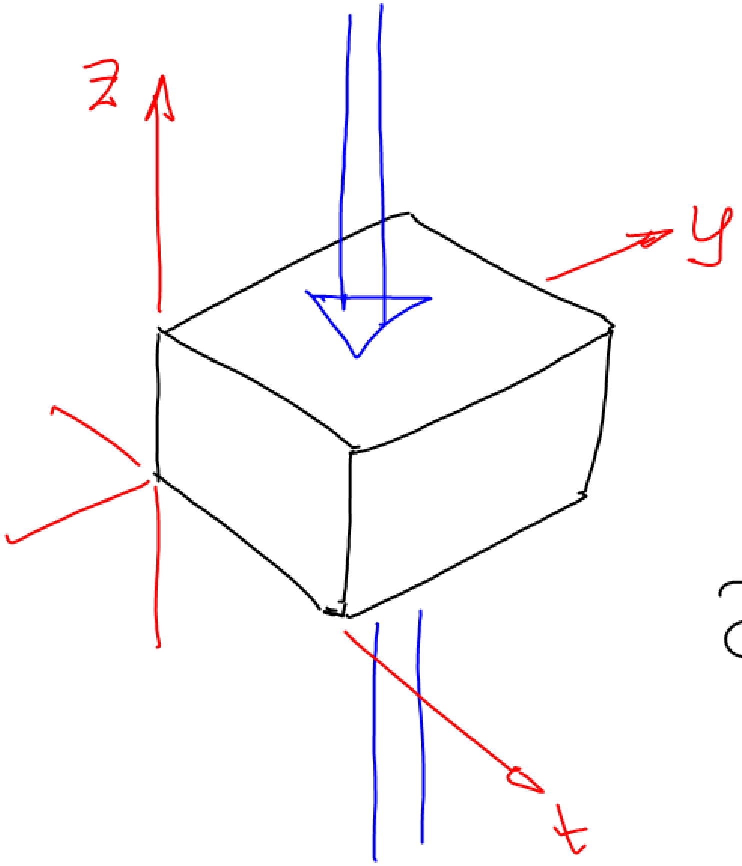
Capítulo 5.- Ecuaciones Diferenciales en Derivadas Parciales y Serie Trigonométrica de Fourier

	Licenc.	Vida Real
EDO	80%	30%
EDenDP	20%	70%

álave



$$\frac{\partial^2 T}{\partial x^2} + k\,\frac{\partial^2 T}{\partial t^2} = 0$$

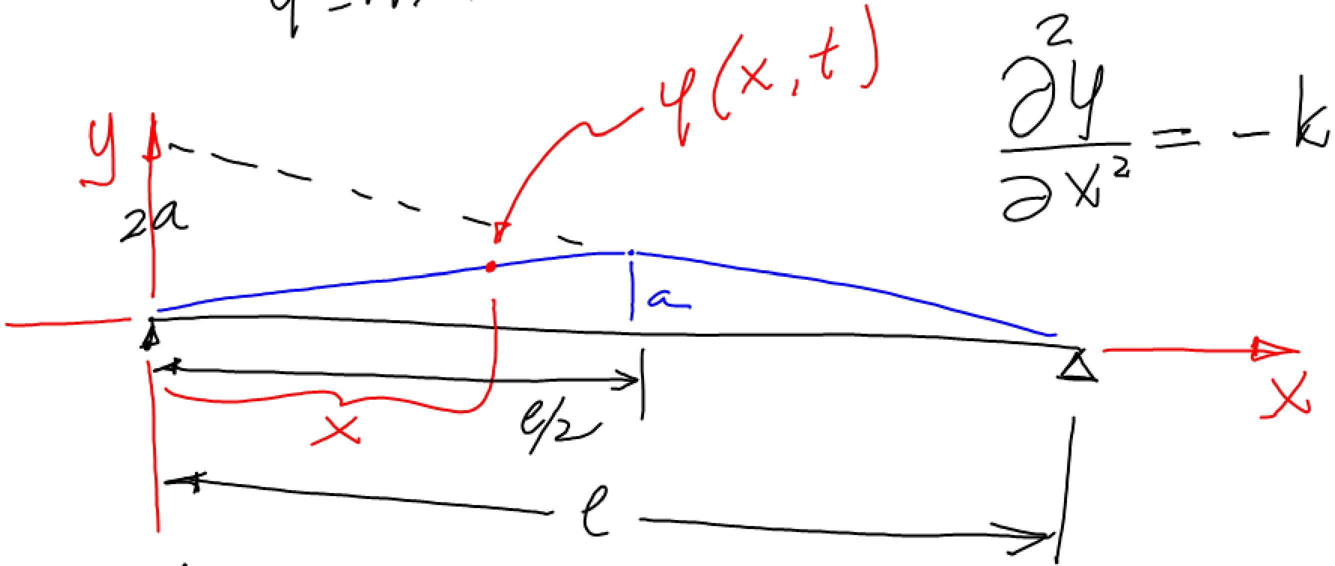


$$z(x, y)$$

$$\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = kz$$

$$y = mx + b$$

$$\frac{\partial^2 y}{\partial x^2} = -k^2 \frac{\partial^2 y}{\partial t^2}$$



Condiciones frontera

$$y(0,t) = 0$$

$$y(\ell,t) = 0$$

condiciones iniciales en el tiempo

$$y(x,0) = \begin{cases} \frac{2a}{\ell} x & ; \ 0 \le x < \frac{\ell}{2} \\ 2a - \frac{2a}{\ell} x & ; \ \frac{\ell}{2} \le x \le \ell \end{cases}$$

$$\left.\frac{\partial}{\partial t} y(x,t)\right|_{t=0} = 0$$

EDenDP orden es igual la definición a las ordinarias

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linealidad EDenDP

- Lineales $\quad \dfrac{\partial^2 F}{\partial x^2} + a_1 \dfrac{\partial^2 F}{\partial y^2} = 0$
- Cuasi-lineales $\quad \dfrac{\partial F}{\partial x} + a_1 \dfrac{\partial F}{\partial y} = F^3$
- No-lineales $\quad \left(\dfrac{\partial F}{\partial x}\right)^3 + a_1 \left(\dfrac{\partial F}{\partial y}\right)^2 = F^2$

La Solución General no es única.

$$F(x,y)$$

$$\frac{\partial^2 F}{\partial x^2} - 6\frac{\partial^2 F}{\partial x \partial y} + 8\frac{\partial^2 F}{\partial y^2} = 0$$

$$F(x,y) = f_i(y + mx) \qquad F \Rightarrow f_i(u)$$

$$u = y + mx$$

$$\frac{\partial F}{\partial x} = \frac{df}{du}\cdot\frac{\partial u}{\partial x} \Rightarrow f'\cdot m \longrightarrow \frac{\partial^2 F}{\partial x^2} = m^2 f''$$

$$\frac{\partial F}{\partial y} \Rightarrow \frac{df}{du}\cdot\frac{\partial u}{\partial y} \Rightarrow f'\cdot(1).$$

$$\frac{\partial^2 F}{\partial x \partial y} = m f''$$

$$\frac{\partial^2 F}{\partial y^2} = f''$$

$$\frac{\partial^2 F}{\partial x^2} + a_1 \frac{\partial^2 F}{\partial x \partial x} + a_2 \frac{\partial^2 F}{\partial y^2} = 0$$

$$m^2 f'' - 6m f'' + 8 f'' = 0$$

$$(m^2 - 6m + 8) f'' = 0 \quad \begin{cases} f'' = 0 \\ m^2 - 6m + 8 = 0 \end{cases}$$

$$f''(u) = 0 \rightarrow f'(u) = k_1 \longrightarrow f(u) \Rightarrow k_1 u + k_2$$

$$f(y+mx) = k_1(y+mx) + k_2 \Rightarrow k_1 y + k_2 m x + k_2$$

<u>trivial</u>

$$m^2 - 6m + 8 = 0 \qquad (m-2)(m-4) = 0$$

$$m_1 = 2 \qquad f_1(y+2x) \qquad f_2(y+4x)$$
$$m_2 = 4$$

$$\boxed{F_g(x,y) = f_1(y+2x) + f_2(y+4x).}$$

$$F_p = 4e^{(y+2x)} + 8e^{(y+4x)}$$

$$\frac{\partial F}{\partial x} = 4 \cdot 2e^{(y+2x)} + 8 \cdot 4e^{(y+4x)}$$

$$\frac{\partial F}{\partial y} = 4e^{(y+2x)} + 8e^{(y+4x)}$$

$$\frac{\partial F}{\partial x} = 8e^{(y+2x)} + 32e^{(y+4x)}$$

$$\frac{\partial^2 F}{\partial x^2} = 16e^{(y+2x)} + 128e^{(y+4x)}$$

$$\frac{\partial^2 F}{\partial y^2} = 4e^{(y+2x)} + 8e^{(y+4x)}$$

$$\frac{\partial^2 F}{\partial x \partial y} = 8e^{(y+2x)} + 32e^{(y+4x)}$$

$\dfrac{\partial^2 F}{\partial x^2}$	$16e^{(y+2x)} + 128e^{(y+4x)}$
$+$	
$-6\dfrac{\partial^2 F}{\partial x \partial y}$	$-48e^{(y+2x)} - 192e^{(y+4x)}$
$+$	
$8\dfrac{\partial^2 F}{\partial y^2}$	$32e^{(y+2x)} + 64e^{(y+4x)}$
$=$	

$$(0) = (0)e^{(y+2x)} + (0)e^{(y+4x)}$$