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TEMA 3: Ecuaciones en derivadas parciales *

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Resolver las EDP siguientes:

1. //Oteo//

EDP	$u_t = u_{xx}$
CC	$u(0, t) = 0 \quad (0 < t < \infty)$ $u(1, t) = 0$
CI	$u(x, 0) = 1 \quad (0 < x < 1)$

2. //Oteo//

EDP	$u_t = u_{xx}$
CC	$u(0, t) = 0 \quad (0 < t < \infty)$ $u(1, t) = 0$
CI	$u(x, 0) = x^2 - x \quad (0 < x < 1)$

3. //Oteo//

EDP	$u_{tt} = u_{xx}$
CC	$u(0, t) = 0 \quad (0 < t < \infty)$ $u(L, t) = 0$
CI	$u(x, 0) = \sin(3\pi x/L) \quad (0 < x < L)$ $u_t(x, 0) = (3\pi\alpha/L) \sin(3\pi x/L)$

4. //Oteo// Problema de la cuerda de guitarra vibrando

EDP	$u_{tt} = u_{xx}$
CC	$u(0, t) = 0 \quad (0 < t < \infty)$ $u(1, t) = 0 \quad (0 < x < 1)$
CI	$u(x, 0) = \begin{cases} 2hx & x \leq 1/2 \\ 2h(1-x) & 1/2 < x \leq 1 \end{cases}$ $u_t(x, 0) = 0 \quad h : cte.$

5. //Alejandro [Luis]//

EDP	$u_t = \alpha^2 u_{xx}$
CC	$u(0, t) = 0 \quad (0 < t < \infty)$ $u(1, t) = 2$
CI	$u(x, 0) = 2x + \sin 3\pi x \quad (0 < x < 1)$

*Preguntas y soluciones contrastadas por [...]

6. //Jesús [Fabián]//

EDP	$u_{tt} = c^2 u_{xx}$
CI	$u(x, 0) = \exp(-x^3/5) \quad (-\infty < x < \infty)$ $u_t(x, 0) = x \exp(-x^2) \quad (0 < t < \infty)$

7. //Fabián [Jesús]//

EDP	$u_{tt} = c^2 u_{xx}$
CI	$u(x, 0) = \sin^3 x \quad (-\infty < x < \infty)$ $u_t(x, 0) = \cos^2 x \quad (0 < t < \infty)$

8. //Fernando [Erica]//

EDP	$u_{tt} = c^2 u_{xx}$
CI	$u(x, 0) = \sin x \quad (-\infty < x < \infty)$ $u_t(x, 0) = x \sin x \cos x \quad (0 < t < \infty)$

9. //Pablo [Miguel Angel]//

EDP	$u_{tt} = c^2 u_{xx}$
CI	$u(x, 0) = \exp(-x^2) \quad (-\infty < x < \infty)$ $u_t(x, 0) = 1, \text{ si } x < 1; = 0, \text{ si } x > 1 \quad (0 < t < \infty)$

10. //Miguel Angel [Fernando]//

EDP	$u_{tt} = c^2 u_{xx}$
CC	$u(0, t) = 0 \quad (0 < t < \infty)$ $u(1, t) = 0$
CI	$u(x, 0) = 0 \quad (0 < x < 1)$ $u_t(x, 0) = \cos(\pi x)$

11. //Luis [Alejandro]//

EDP	$u_{tt} = 4u_{xx}$
CC	$u(0, t) = 0 \quad (0 < t < \infty)$ $u(\pi, t) = 0 !!$
CI	$u(x, 0) = (\sin^3 x)/10 \quad (0 < x < \pi)$ $u_t(x, 0) = 0$

12. //Erica [Esther]//

EDP	$u_t = \alpha^2 u_{xx}$
CC	$u(0, t) = 0 \quad (0 < t < \infty)$ $u(1, t) = 0$
CI	$u(x, 0) = \begin{cases} x & x \leq 1/2 \\ 1-x & 1/2 < x \leq 1 \end{cases} \quad (0 < x < 1)$

13. //Carlos [Javier]//

EDP	$u_t = \alpha^2 u_{xx}$
CC	$u(0, t) = 1 \quad (0 < t < \infty)$ $u(1, t) = 1/e$
CI	$u(x, 0) = \exp(-x) \quad (0 < x < 1)$

14. //Erica [Fernando]//

EDP	$u_{tt} = c^2 u_{xx}$
CC	$u(0, t) = 0 \quad (0 < t < \infty)$ $u(1, t) = 0 \quad (0 < x < 1)$
CI	$u_t(x, 0) = \begin{cases} x & x \leq 1/2 \\ 1 - x & 1/2 < x \leq 1 \end{cases}$ $u(x, 0) = -\sin \pi x$

15. //Fernando [Pablo]//

EDP	$u_{tt} = c^2 u_{xx}$
CC	$u(0, t) = 0 \quad (0 < t < \infty)$ $u(1, t) = 0 \quad (0 < x < 1)$
CI	$u(x, 0) = \begin{cases} x & x \leq 1/2 \\ 1 - x & 1/2 < x \leq 1 \end{cases}$ $u_t(x, 0) = \begin{cases} 1 - x & x \leq 1/2 \\ x & 1/2 < x \leq 1 \end{cases}$