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TEMA 3: Ecuaciones en derivadas parciales [*]

15 de enero de 2010

Resolver las EDP siguientes:

1. //Oteo//

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

2. //Oteo//

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

3. //Oteo//

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

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

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

5. //Pablo Z. [Carlos M.]//

EDP	$u_{tt} = c^2 u_{xx},$	$(0 < t < \infty)$
CI	$u(x,0) = \sqrt{1-x^2},$	$-1 < x < 1; \quad u(x,0) = 0, \quad$ si no
	$u_t(x,0) = cx/\sqrt{1-x^2},$	$-1 < x < 1; \quad u_t(x,0) = 0, \quad$ si no

6. //Adrián R. [Jorge G.]//

EDP	$u_{tt} = c^2 u_{xx}$	
CI	$u(x,0) = x$	$(-\infty < x < \infty)$
	$u_t(x,0) = 1/(1 + \exp x)$	$(0 < t < \infty)$

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[*]Preguntas y soluciones contrastadas por [...]

7. //Roser [Cristina]//

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

8. //Cristina [Roser]//

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

9. //Torroba [Jorge P.]//

EDP	$u_{tt} = c^2 u_{xx}$	
CI	$u(x,0) = 1/(1+|x|)$	$(-\infty < x < \infty)$
	$u_t(x,0) = \exp(-x)$	$(0 < t < \infty)$

10. //Luis G. [Gonzalo]//

EDP	$u_{tt} = 16 u_{xx}$	
CC	$u(0,t) = 0$	$(0 < t < \infty)$
	$u(\pi,t) = 0$	
CI	$u(x,0) = 8 - 15x^2$	$(0 < x < \pi)$
	$u_t(x,0) = 23$	

11. //Andrés U. [Aitor]//

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

12. //Jorge P. [Carlos S.]//

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

13. //Chimo [Victoria]//

EDP	$u_{tt} = \alpha^2 u_{xx}$	
CC	$u(0,t) = h$ $(0 < t < \infty)$, $(0 < x < L)$	
	$u(L,t) = 0$	
CI	$u(x,0) = h - 2hx/L$ $(si \; x < L/3)$; $u(x,0) = h/2 - hx/2L$ $(si \; x \geq L/3)$	
	$u_t(x,0) = 0$	

14. //Victoria [Chimo]//

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

15. //Gonzalo [Luis]//

EDP	$u_t = \alpha^2 u_{xx}, \quad \alpha = 2$	
CC	$u(0,t) = 0$	$(0 < t < \infty)$
	$u(1,t) = 0$	
CI	$u(x,0) = 42x$	$(0 < x < 1)$

16. //Pablo C. [Leo]//

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

17. //Carlos F. [Jorge L.]//

EDP	$u_t = \alpha^2 u_{xx}$
CC	$u(0,t) = 0$ $(0 < t < \infty)$
	$u(1,t) = 0$
CI	$u(x,0) = 4x$ $(0 < x < 1)$

18. //Adrián [Jorge G.]//

EDP	$u_t = \alpha^2 u_{xx}$
CC	$u(0,t) = 2$ $(0 < t < \infty)$
	$u(1,t) = 1$
CI	$u(x,0) = 4 - x$ $(0 < x < 1)$

19. //Jorge L. [Carlos F.]//

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

20. //Jorge G. [Adrián]//

EDP	$u_t = \alpha^2 u_{xx}$
CC	$u(0,t) = 5$ $(0 < t < \infty)$
	$u(\pi,t) = 10$
CI	$u(x,0) = 5x$ $(0 < x < \pi)$

21. //Jorge P. [Carlos S.]//

EDP	$u_t = \alpha^2 u_{xx}$
CC	$u(0,t) = 7$ $(0 < t < \infty)$
	$u(12,t) = -5$
CI	$u(x,0) = 2x$ $(0 < x < 12)$

22. //Leo [Pablo C.]//

EDP	$u_{tt} = c^2 u_{xx}$
CC	$u(0,t) = 0$ $(0 < t < \infty)$
	$u(1,t) = 0$ $(0 < x < 1)$
CI	$u(x,0) = 0$
	$u_t(x,0) = \begin{cases} -2hx & x \le 1/2 \\ 4h(x - 1/2) - h & 1/2 < x \le 1 \end{cases}$