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Teórica (UEG). [MMF3-B:2007-8]

TEMA 2: (II) EDO: Sistemas *

30 de noviembre de 2007

1. //Oteo//

- a) Resolver cualitativamente en el plano xy para los casos:
1) $\mu < 0$ y 2) $\mu > 0$

$$\begin{aligned}y' &= \mu y - y^3 \\z' &= -z\end{aligned}$$

- b) Resolver cualitativamente en el plano xy:

$$\begin{aligned}y' &= -2y - yz \\z' &= -z - y + 1\end{aligned}$$

- c) Resolver cualitativamente (*Love affairs and differential equations*, S.H. Strogatz, *Mathematics Magazine* Vol.61 (1988) p.35):

$$\begin{aligned}\dot{R} &= aR + bJ \\ \dot{J} &= cR + dJ\end{aligned}$$

en los casos:

- 1) Romeo y Julieta *cautelosos* $d = a, c = b, a < 0, b > 0$
- 2) Sugerir el *estilo* $a = 0, b = 1, c = -1, d = 1$
- 3) *Fuego y agua*: se atraen los opuestos? $c = -b, d = -a$

2. //Luis [María]//

$$\frac{d}{dt} \vec{x} = \begin{pmatrix} 2 & 1 \\ -1 & 1 \end{pmatrix} \vec{x}$$

3. //María [Luis]// Resolver con c.i. $y(0) = z(0) = 1$:

$$\begin{aligned}y' &= z/2 + 1 \\z' &= 2y + 2\end{aligned}$$

4. //Carmina [Celia]// Resolver con c.i. $y(0) = 2, z(0) = 1$:

$$\begin{aligned}y' &= 2z + \exp(2t) \\z' &= 3y + z + \exp(2t)\end{aligned}$$

* Preguntas y soluciones contrastadas por [...]

5. //Celia [Carmina]// Resolver con c.i. $x(0) = 1, y(0) = 0, z(0) = 1$:

$$\begin{aligned}x' &= x + 3z + \exp(4t) \\y' &= -2y + \exp(-2t) \\z' &= 3x + z + \exp(4t)\end{aligned}$$

6. //José Alfonso [Ignacio]// Resolver con c.i. $x(0) = 1, y(0) = 1$:

$$\begin{aligned}\dot{x} &= ax + by + \exp(at) \\ \dot{y} &= bx + ay + \exp(at)\end{aligned}$$

7. //Nestor [Pablo Bru]// Resolver con c.i. $x(0) = 1, y(0) = 2$:

$$\begin{aligned}\dot{x} &= 3x + 2y + 1 \\ \dot{y} &= 8x + 3y + 2\end{aligned}$$

8. //Pablo Bru [Nestor]// Resolver con c.i. $y(0) = 1, z(0) = 1$:

$$\begin{aligned}\dot{y} &= z + \sin t \\ \dot{z} &= y\end{aligned}$$

9. //Teresa [Fco. Javier]// Resolver con c.i. $y(0) = 1, z(0) = 1$:

$$\begin{aligned}\dot{y} &= -z + 2 \\ \dot{z} &= y - 1\end{aligned}$$

10. //Fco. Javier [Teresa]//

$$\begin{aligned}\dot{y} &= 2y + 3z \\ \dot{z} &= 4y + z\end{aligned}$$

11. //Ignacio [José Alfonso]// Resolver con c.i. $y(0) = 1, z(0) = -1/3$:

$$\begin{aligned}\dot{y} &= z + \exp(2t) \\ \dot{z} &= y + \exp(-2t)\end{aligned}$$

12. //Mireia [Javier]// Resolver con c.i. $x(0) = 2, y(0) = -2$:

$$\begin{aligned}\dot{x} &= -2y \\ \dot{y} &= x + 3y + \exp(t)\end{aligned}$$

13. //Javier [Mireia]// Resolver con c.i. $x(0) = \pi, y(0) = e, z(0) = \phi$:

$$\begin{aligned}x' &= x + y + z \\ y' &= 2y + z \\ z' &= 3z\end{aligned}$$

14. //Gloria [Noelia]//

$$\begin{aligned}\dot{y} &= 2y + z \\ \dot{z} &= y + 3z\end{aligned}$$

15. //Paloma [Carlos A.]//

$$\begin{aligned}y' &= y + z + x \\z' &= -4y - 3z + 2x\end{aligned}$$

16. //Carlos A. [Paloma]//

$$\begin{aligned}y' &= -2y - 4z + 4x + 1 \\z' &= -y + z + 3x^2/2\end{aligned}$$

17. //Sergio C. [Victor]//

$$\begin{aligned}\dot{x} &= x + 2y \\ \dot{y} &= -y \\ \dot{z} &= x + 3y + 2z\end{aligned}$$

18. //Sergio [Adrián]//

$$\begin{aligned}\dot{y} &= z + \ln t \\ \dot{z} &= 4y - 1/t\end{aligned}$$

19. //Adrián [Sergio]//

$$\begin{aligned}\dot{y} &= 3y + z - \sin t \\ \dot{z} &= z + 2\end{aligned}$$

20. //Bernat [Carlos R.]// Resolver con c.i. $y(0) = 2, z(0) = 0$:

$$\begin{aligned}\dot{y} &= z + 2t \\ \dot{z} &= y + 1\end{aligned}$$

21. //Héctor [Miguel]// Resolver con c.i. $y(0) = 1, z(0) = 1$:

$$\begin{aligned}\dot{y} &= y + 2z + 2t \\ \dot{z} &= 2y + z\end{aligned}$$

22. //Mireia [José Alfonso]// Resolver cualitativamente en el plano xy :

$$\begin{aligned}\dot{x} &= xy - x^2 + 2x \\ \dot{y} &= xy + y^2 - 6y\end{aligned}$$