

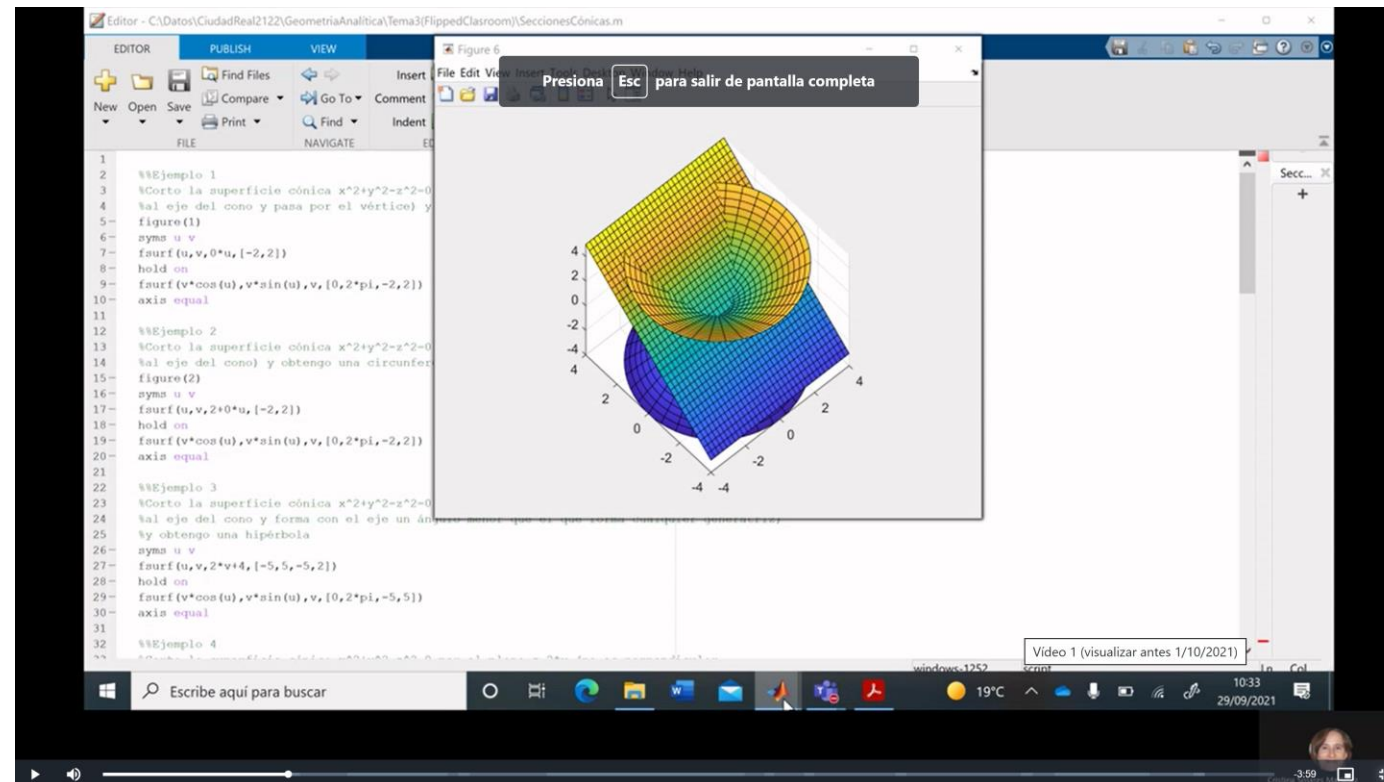
VIDEOS AND MATLAB FOR TEACHING CONIC SECTIONS

Cristina Solares and Rocío Blanco



Introduction

This paper proposes the use of educational videos and Matlab to help first-year engineering students to understand the conic sections, combining the flipped classroom methodology with ICTs such as Matlab.



Objective

- To get students to understand the elements of conics.
- To enable students to visualise conics and their elements.
- To provide students with a tool that allows them to represent conics and their elements.
- Employing an active teaching-learning methodology.
- To increase students' interest and motivation in the subject of conics.
- Facilitating students' autonomous learning.



Methodology

Session 2:

1. The students should visualize at home five videos about the ellipse. The videos contain different power point presentations and examples developed by the teacher by hand.

Ejemplo

En la siguiente figura se muestra la elipse

$$\frac{(x-2)^2}{9} + \frac{(y-1)^2}{5} = 1$$

con excentricidad $e = 2/3$. Se muestra el centro, vértices, focos, ejes de simetría y directrices.

Elipse con directrices

$e = \frac{c}{a}$
 $c = 2$
 $a = 3$
 $\frac{a}{e} = \frac{9}{2}$

$x = 2 - \frac{9}{2}$ $x = 2 + \frac{9}{2}$

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Cristina Solares

Ej) Hallar el centro, vértices y focos de la elipse determinada por la ecuación $4x^2 - 8x + y^2 + 4y - 8 = 0$

completamos cuadrados:

$$4(x^2 - 2x + 1) + (y^2 + 4y + 4) = 8 + 4 + 4$$

$$4(x-1)^2 + (y+2)^2 = 16$$

$$\frac{(x-1)^2}{4} + \frac{(y+2)^2}{16} = 1$$

• Eje mayor paralelo al eje y

Centro $(h_1, h_2) = (1, -2)$

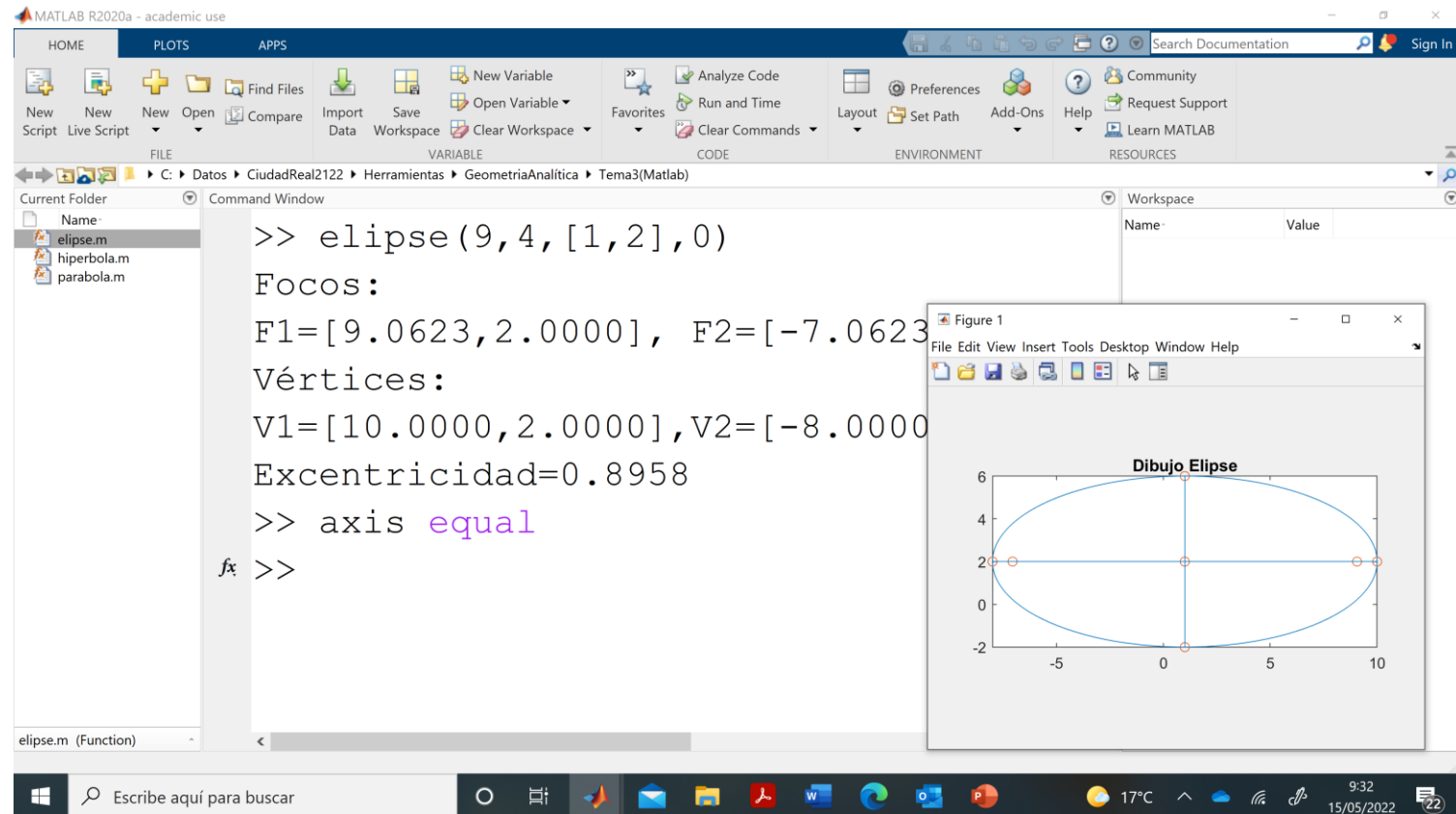
$a = 4, b = 2 \Rightarrow c = \sqrt{16 - 4} = 2\sqrt{3}$

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0:01:33

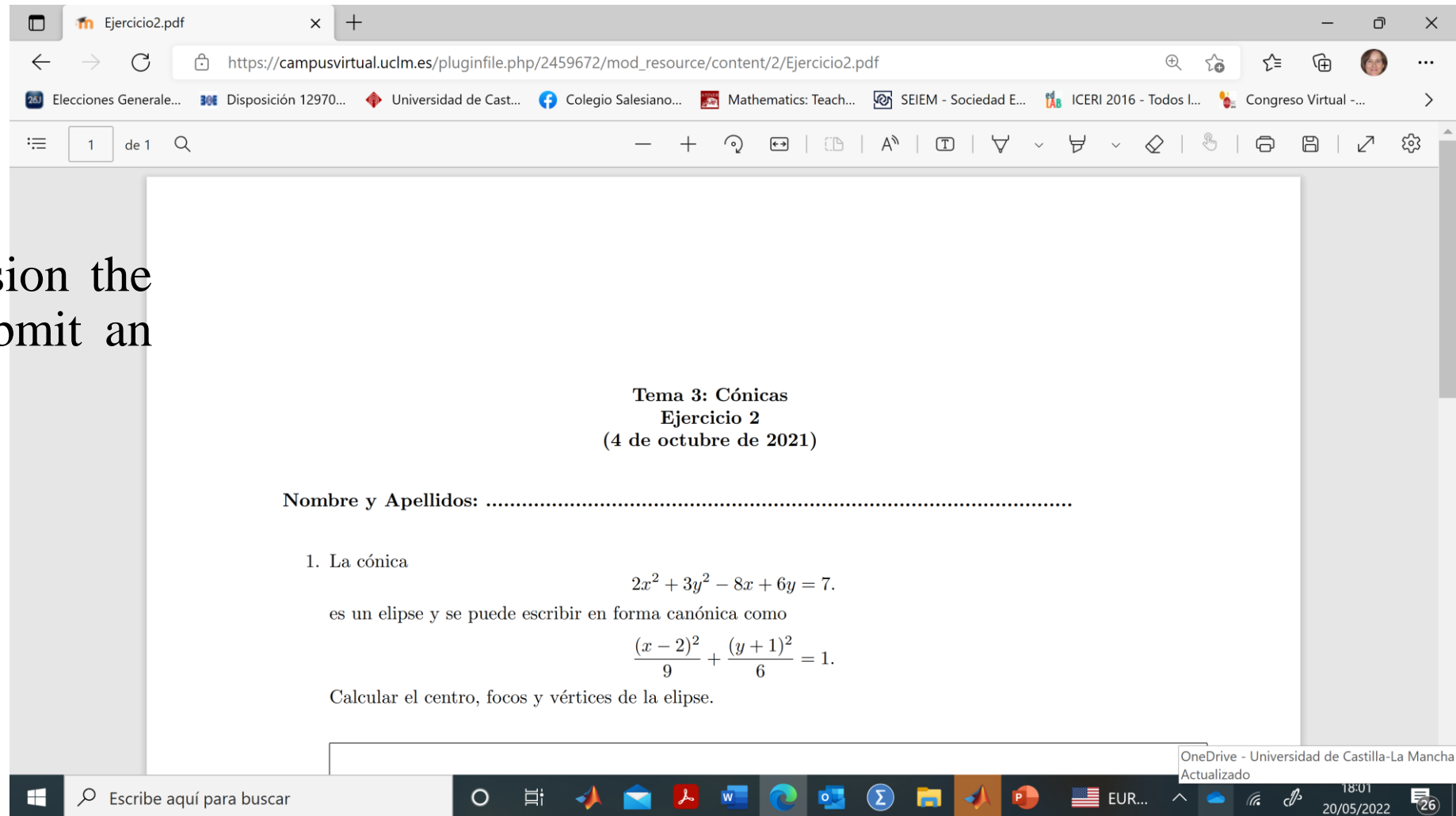
Session 2:

- During the classes the teacher reviews the above concepts, and the students complete a Matlab program. The students should be able to calculate and draw with Matlab all the elements of an ellipse.



Session 2:

3. At the end of the session the students solve and submit an exercise.



Ejercicio2.pdf

https://campusvirtual.uclm.es/pluginfile.php/2459672/mod_resource/content/2/Ejercicio2.pdf

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Tema 3: Cónicas
Ejercicio 2
(4 de octubre de 2021)

Nombre y Apellidos:

1. La cónica

$$2x^2 + 3y^2 - 8x + 6y = 7.$$

es un elipse y se puede escribir en forma canónica como

$$\frac{(x - 2)^2}{9} + \frac{(y + 1)^2}{6} = 1.$$

Calcular el centro, focos y vértices de la elipse.

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Conclusion

- The main contribution of the work is the methodology used as a teaching-learning resource at university level.
- During the intervention, the students have achieved a good understanding of the elements of conics, participated more actively in the construction of their knowledge and visualized abstract concepts.
- The results of the satisfaction survey show the high impact that the methodology has caused on the students' perception of the subject.

