

*NOTE: All the problems are posed in the Euclidean affine space endowed with a Cartesian rectangular reference system.*

1.– Given the quadric with equation:

$$2x^2 - y^2 - z^2 - 2xy + 2xz - 4yz - 2x + 2y = 0.$$

classify the surface and sketch a drawing of it.

**(Final exam, May 2015)**

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2.– Given the equation:

$$x^2 + 2y^2 + 5z^2 + 2xy + 2xz + 2yz + 4x + 2y + 4z + 1 = 0,$$

classify the quadric it defines and sketch a picture of it.

**(Final exam, July 2012)**

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3.– Write the equation of:

- (a) a non-degenerate quadric that does not contain any ellipses.
- (b) a non-degenerate quadric containing ellipses and infinitely many lines.
- (c) a quadric containing ellipses, parabolas and hyperbolas.

**(Final exam, September 2009)**

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4.– Given the quadric with equation

$$3x^2 + 2y^2 - z^2 + 4xy + 2xz + 4x - 4z - 1 = 0.$$

classify the surface and sketch a drawing of it.

**(Final exam, May 2013)**

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5.– Given the quadric with equation:

$$x^2 + 2y^2 + z^2 + 6xz - 2x + 4y - 6z + 3 = 0.$$

- i) Classify the surface and sketch a picture of it.
- ii) Is there any plane that cuts the surface in a parabola?

**(Final exam, June 2013)**

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6.— We consider the family of quadrics of  $\mathbb{R}^3$ :

$$Q_{\alpha,\beta} : x^2 + \alpha z^2 + 2\beta x + 2\beta y + 2\beta z = 0$$

Classify the different quadrics in this family in terms of  $\alpha$  and  $\beta$ .

**(Final exam, December 2005)**

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7.— In the Euclidean space and with respect to a rectangular reference, consider the quadrics given by the equations

$$x^2 - 2y^2 + az^2 - 2xz + 2yz + 2x + 1 = 0, \quad \text{with } a \in \mathbb{R}.$$

Classify these quadrics in terms of the different values of  $a$ .

**(Final exam, September 2006)**

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8.— In the affine space and with respect to a rectangular reference, consider the quadrics with equations:

$$ax^2 + (1-a)y^2 + az^2 + 2(1-a)xz + 2x + 2z + 3 = 0,$$

with  $a \in \mathbb{R}$ . Classify these quadrics in terms of the parameter  $a$ .

**(Final exam, December 2007)**

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9.— Classify, in terms of the parameter  $\lambda$ , the quadric:

$$(4-\lambda)x^2 + 2y^2 - \lambda z^2 + 4xy + 2\lambda xz + 4x - 4z - \lambda = 0.$$

**(Second partial exam, June 2009)**

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10.— Given the quadric with equation

$$x^2 - 8z^2 + 4xy + 2xz - 8yz + 8y + 8z + 2 = 0$$

classify this surface and sketch a picture of it.

**(Final exam, May 2014)**

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11.— Given the quadric with equation

$$x^2 + 3y^2 + 4z^2 + 2xy + 4xz - 16yz - 12y + 12z + 3 = 0$$

classify the surface and sketch a drawing of it.

**(Final exam, July 2014)**

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