

MARS ATMOSPHERE ENTRY

HYPersonic FLOWS PROJECT

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2 Physics & Modeling

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Physics & Modeling

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Mathematics

Theorem (Fermat's little theorem)

For a prime p and $a \in \mathbb{Z}$ it holds that $a^p \equiv a \pmod{p}$.

Proof.

The invertible elements in a field form a group under multiplication. In particular, the elements

$$1, 2, \dots, p-1 \in \mathbb{Z}_p$$

form a group under multiplication modulo p . This is a group of order $p-1$. For $a \in \mathbb{Z}_p$ and $a \neq 0$ we thus get $a^{p-1} = 1 \in \mathbb{Z}_p$. The claim follows. ■



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Mathematics

Example

The function $\varphi: \mathbb{R} \rightarrow \mathbb{R}$ given by $\varphi(x) = 2x$ is continuous at the point $x = \alpha$, because if $\epsilon > 0$ and $x \in \mathbb{R}$ is such that $|x - \alpha| < \delta = \frac{\epsilon}{2}$, then

$$|\varphi(x) - \varphi(\alpha)| = 2|x - \alpha| < 2\delta = \epsilon.$$



Results

Sometimes it is useful to highlight certain words in the text.

Important message

If a lot of text should be highlighted, it is a good idea to put it in a box.

It is easy to match the colour theme.



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Aerodynamic Coefficient & Kn

■ Bullet lists are marked with a red box.

1 Numbered lists are marked with a white number inside a red box.

Description highlights important words with red text.

Items in numbered lists like 1 can be referenced with a red box.

Example

■ Lists change colour after the environment.



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Aerodynamic Coefficients & Kn

stuff



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Aerodynamic Coefficients & Kn

1 Effects that control

Use textblock for arbitrary placement of objects.



Aerodynamic Coefficients & Kn

- 1 Effects that control
- 2 when text is displayed

Use **textblock** for arbitrary placement of objects.

Theorem

This theorem is only visible on slide number 2.



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Aerodynamic Coefficients & Kn

Use **textblock** for arbitrary placement of objects.

- 1 Effects that control
- 2 when text is displayed
- 3 are specified with `<>` and a list of slides.



Aerodynamic Coefficients & Kn

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Aerodynamic Coefficients & Kn

- 1 Effects that control
- 2 when text is displayed
- 3 are specified with `<>` and a list of slides.

Use **textblock** for arbitrary placement of objects.

It creates a box with the specified width (here in a percentage of the slide's width) and upper left corner at the specified coordinate (x, y) (here x is a percentage of width and y a percentage of height). [5]



References I



Hartshorne, R.
Algebraic Geometry.
Springer-Verlag, 1977.



Helsø, M.
'Rational quartic symmetroids'.
Adv. Geom., 20(1):71–89, 2020.



Helsø, M. and Ranestad, K.
Rational quartic spectrahedra, 2018.
<https://arxiv.org/abs/1810.11235>

- ▶ Atiyah, M. and Macdonald, I.

Introduction to commutative algebra.
Addison-Wesley Publishing Co., Reading, Mass.-London-Don Mills,
Ont., 1969



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References II

[5] Artin, M.

‘On isolated rational singularities of surfaces’.

Amer. J. Math., 80(1):129–136, 1966.



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Thank you!

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