Épreuve de section européenne

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1   General knowledge

Give the properties of a probability density function. Which examples do you know ?

2   Document

The tangent function has its origin in the [...] antiquity. During the Renaissance it was resurrected – though without calling it "tangent" – in connection with the fledgling[a] art of perspective. It is a common experience that an object appears progressively smaller as it moves away from the observer. The effect is particularly noticeable when viewing a tall structure from the ground : as the angle of sight is elevated, features that are equally spaced vertically, such as the floors of a building, appear to be progressively shortened ; and conversely, equal increments in the angle of elevation intercept the structure at points that are increasingly farther apart. A study by the famed Nürnberg artist Albrecht Dürer (1471-1528), one of the founders of perspective, clearly shows this effect.

Dürer and his contemporaries were particularly intrigued by the extreme case of this phenomenon when the angle of elevation approaches 90° and the height seems to increase without limit. [...] Today, of course, we say that $\tan x$ tends to infinity as x approaches 90°, whereas at 90° it is undefined ; but such subtleties were unknown to past generations, and until quite recently one could still find the statement "$\tan 90° = \infty$" in many trigonometry textbooks.

From *Trigonometric Delights*, by Eli Maor.

3   Questions

1. When and why did the tangent function reappear during the Renaissance ?
2. Draw a quick sketch illustrating the third sentence of the text.
3. Comment Dürer's study in relation with the text above.
4. How should the equality "$\tan 90° = \infty$" be written to be correct ?
5. Sketch the graph of the tangent function over $]-2\pi; 2\pi[$.

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[a]starting, burgeoning