



On circles, lines, and spheres: thinking outside the box

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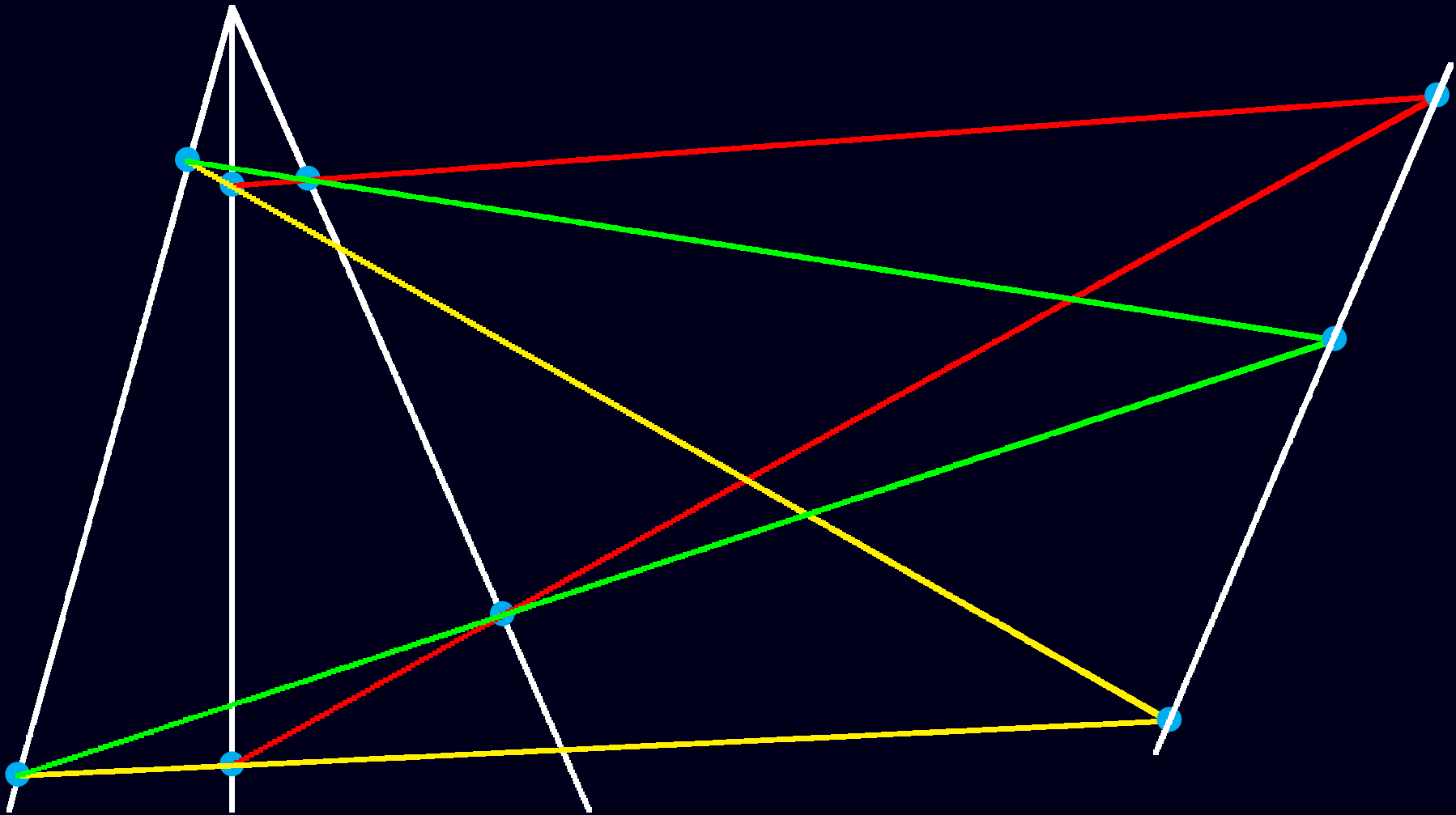


Results from Plane Geometry

- Desargues' Theorem: Girard Desargues (1591–1661)
- Pascal's Theorem: Blaise Pascal (1623–1662)
- Steiner's Porism: Jakob Steiner (1796–1863)
- Penrose's Theorem: Roger Penrose (1931–)

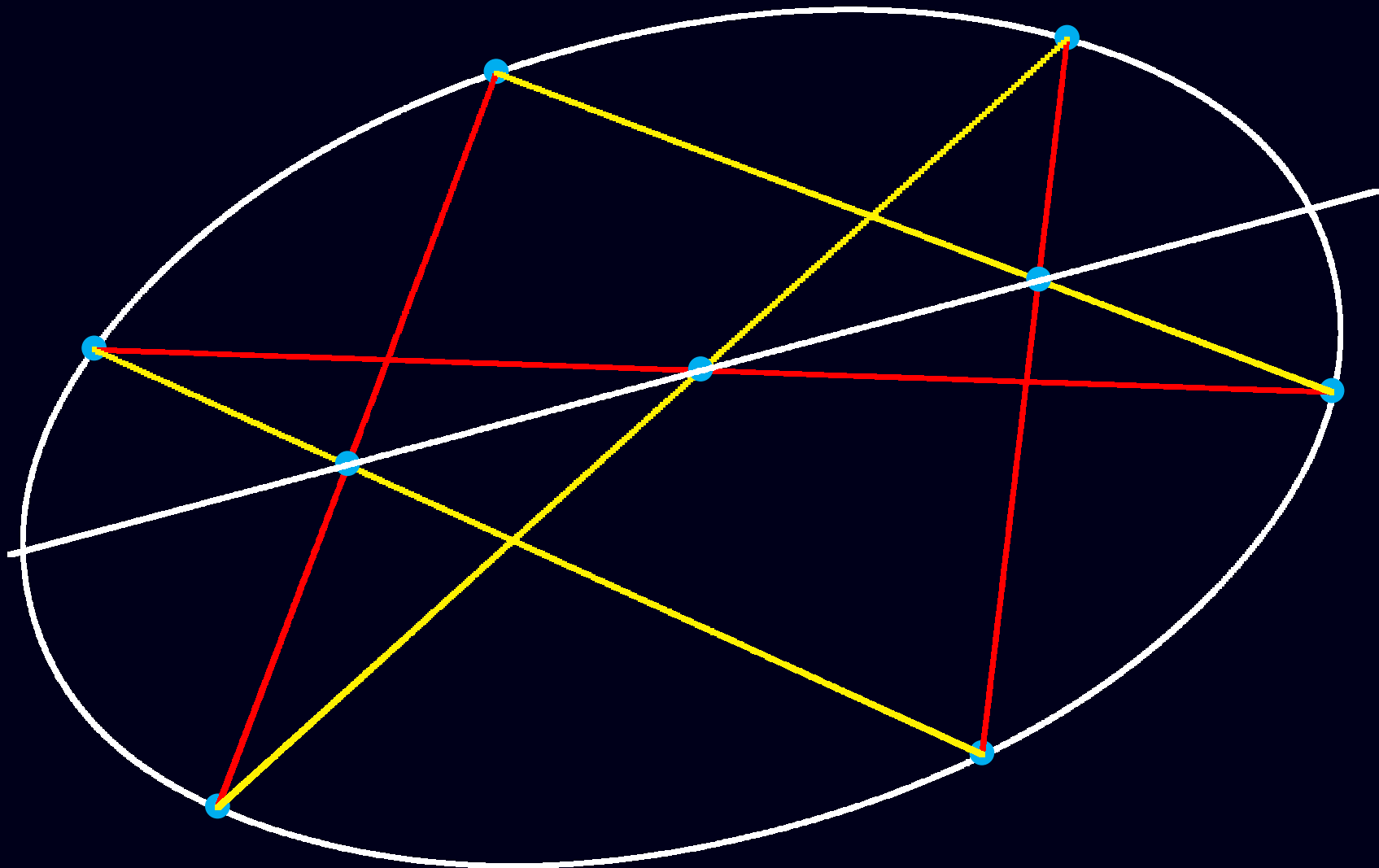
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Desargues' Theorem



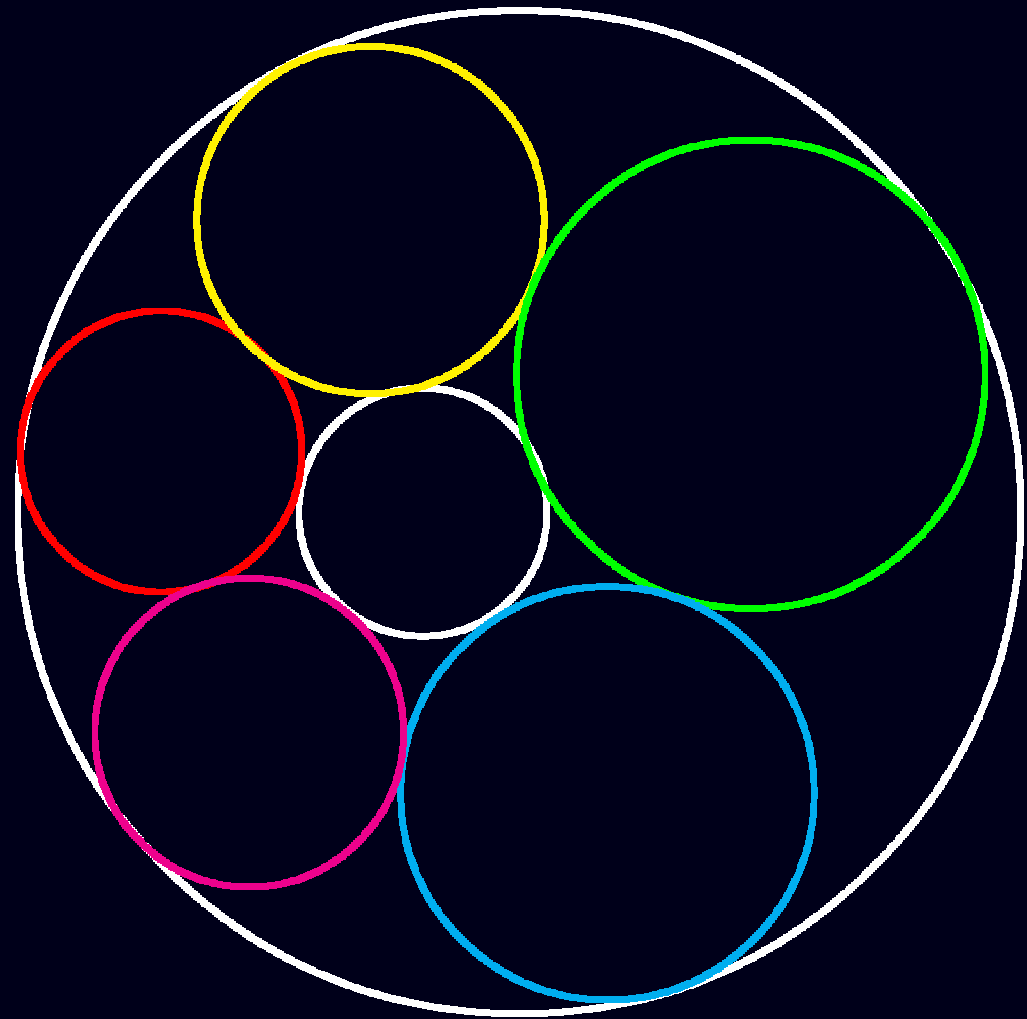
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Pascal's Theorem



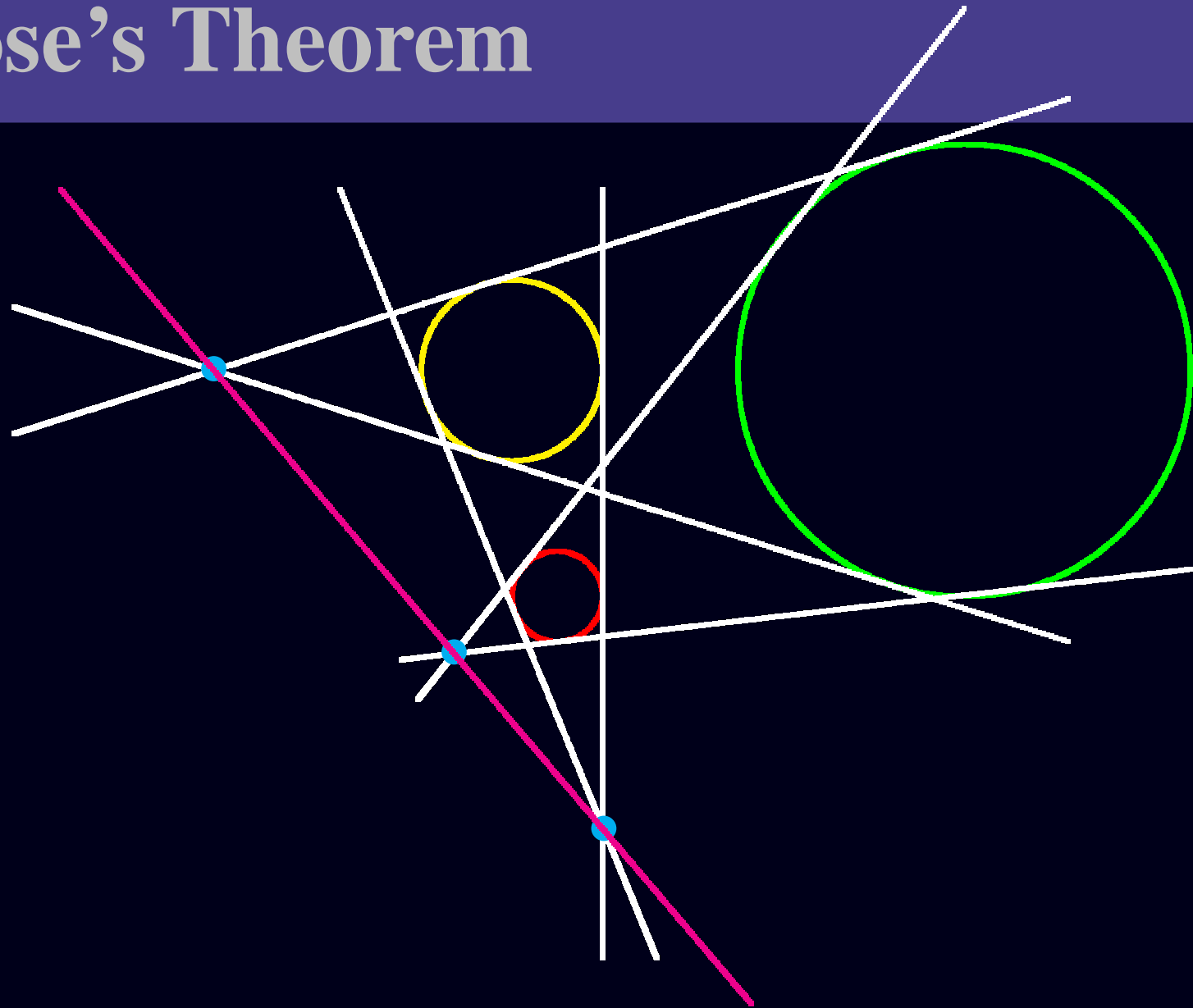
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Steiner's Porism



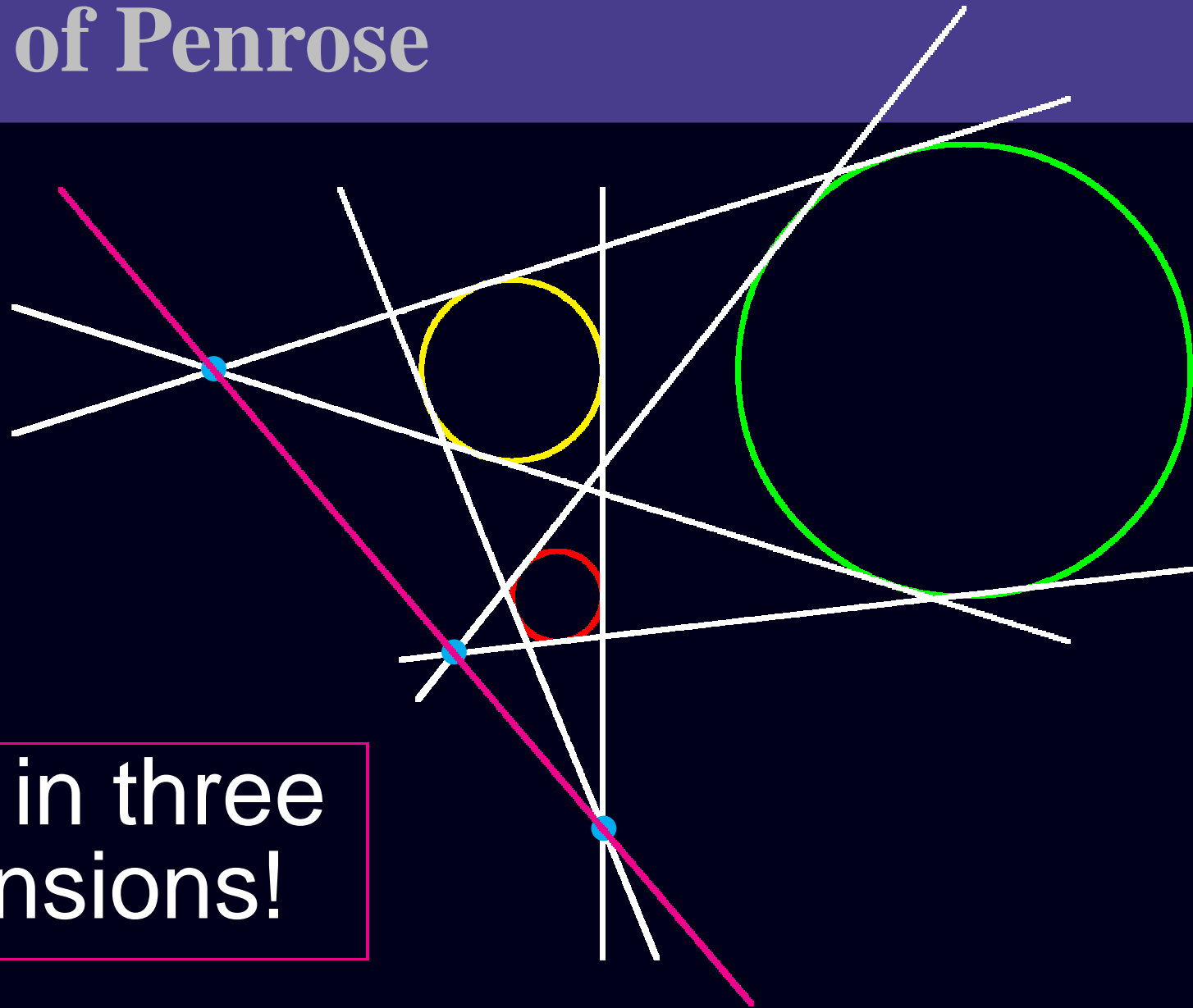
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Penrose's Theorem



⋮

Proof of Penrose

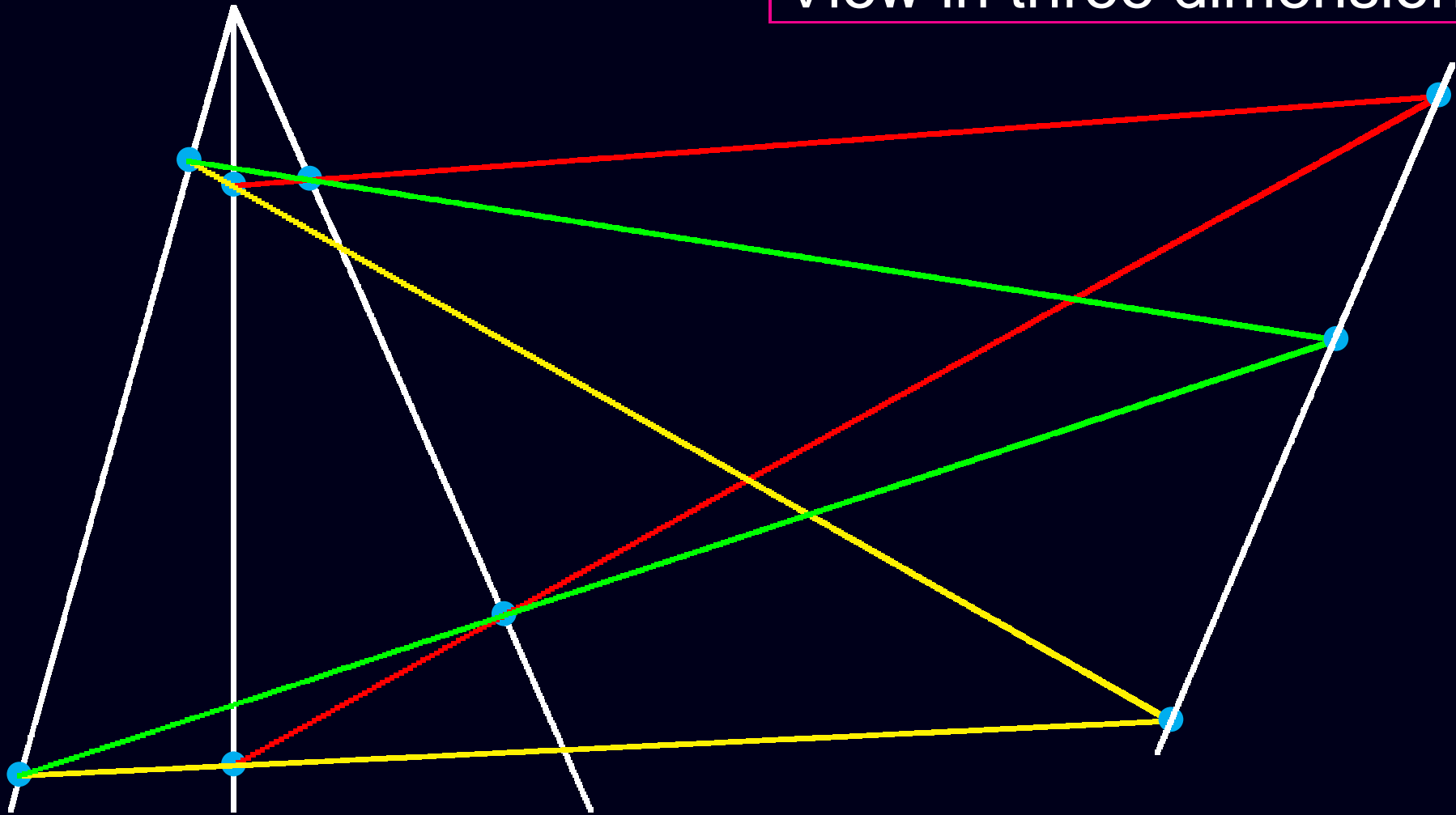


View in three dimensions!

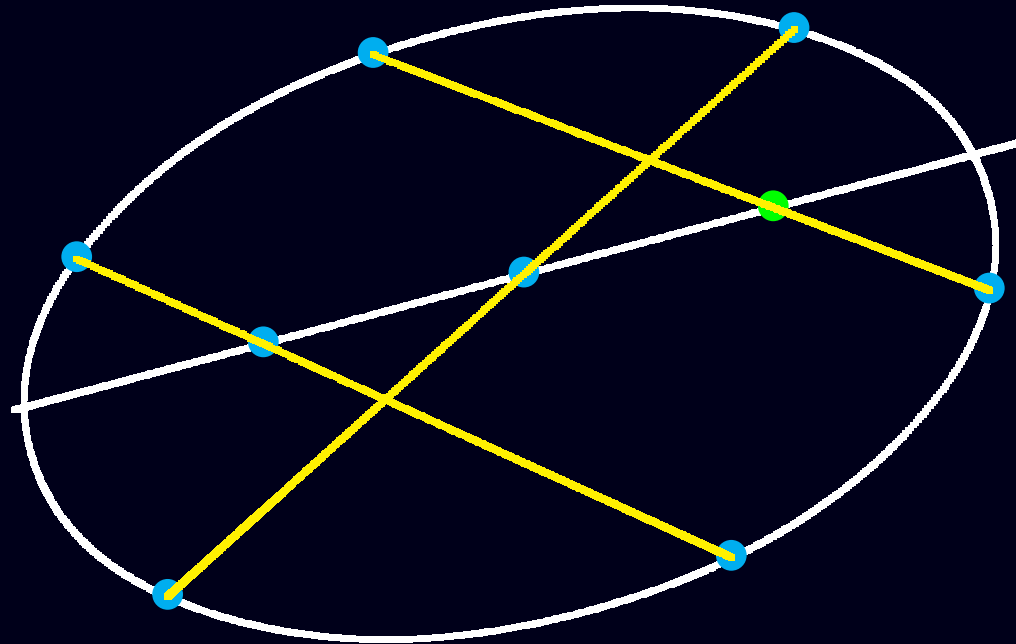
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Proof of Desargues

View in three dimensions!



Proof of Pascal



- Ellipse \cup Line $\xrightarrow{\text{perturb}}$ Cubic! \cap **Lines**
- Use complex numbers!
- Add points at infinity!
- Doughnut $\not\cong$ Sphere: topology!

Further Reading/Viewing

- <http://www.ima.umn.edu/%7Earnold/moebius/>
- <http://www.cut-the-knot.org/geometry.shtml>
- <http://www.maths.gla.ac.uk/%7Ewws/cabripages/cabri0.html>
- <http://www.maths.gla.ac.uk/%7Ewws/cabripages/cabrijava.html>
- <http://www.cabri.net/cabrijava/>



THANK YOU

THE END

