



# PLANARITY TESTING

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# AGENDA

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## Introduction

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## Simple Math

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## Our Solution

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## Live Demonstration

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## Conclusion

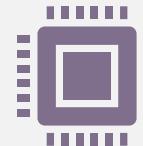
# INTRODUCTION



What is a planar graph?



How does a computer  
read planar graphs?



What can planar graphs  
be used for in the real  
world?

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# DUAL GRAPHS & THE FOUR COLOUR THEOREM

Given any separation of a plane into contiguous regions (like a political map of the world), no more than **4 colors** are required to color the regions so that no two adjacent regions share the same color.

By converting the map to a Dual Graph, mathematicians could apply graph theory rules (like Euler's formula) to solve the map-coloring problem.

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# IMPLEMENTATION OF 3D SPHERES

In computer science, treating a planar graph as if it lives on a sphere (rather than a flat plane) solves several messy coding problems.

Used in multiple areas such as procedural generation

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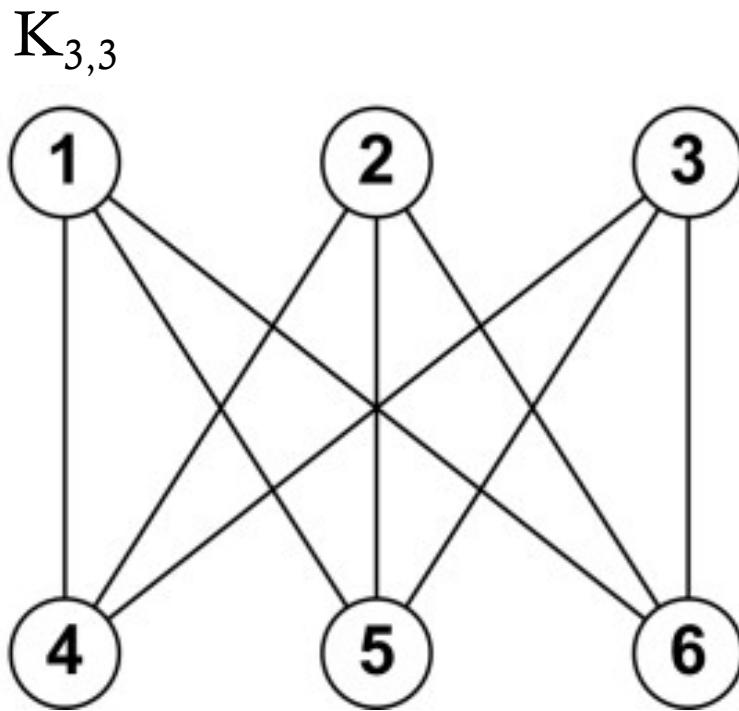
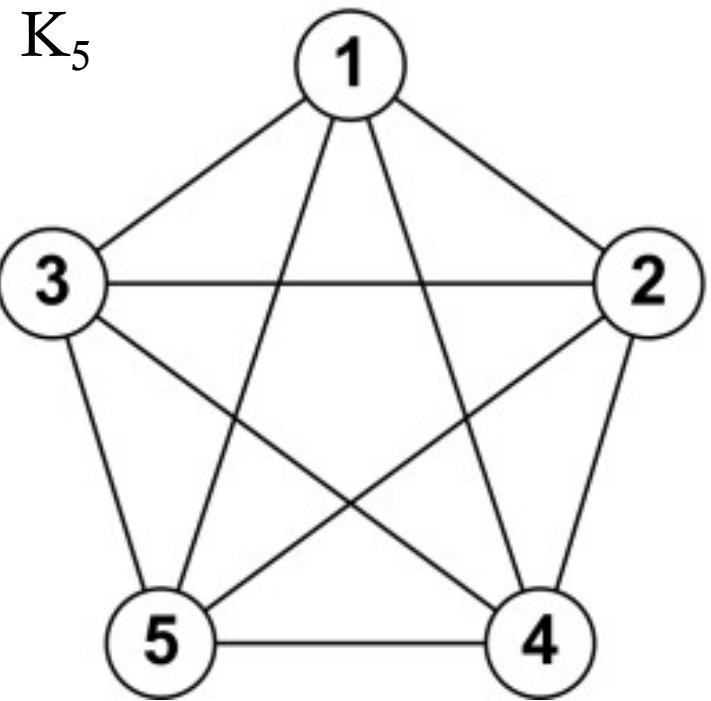
# SIMPLE MATH

## Euler's Formula

- What is Euler's Formula?

$$V - E + F = 2$$

- V = Vertices
- E = Edges
- F = Faces

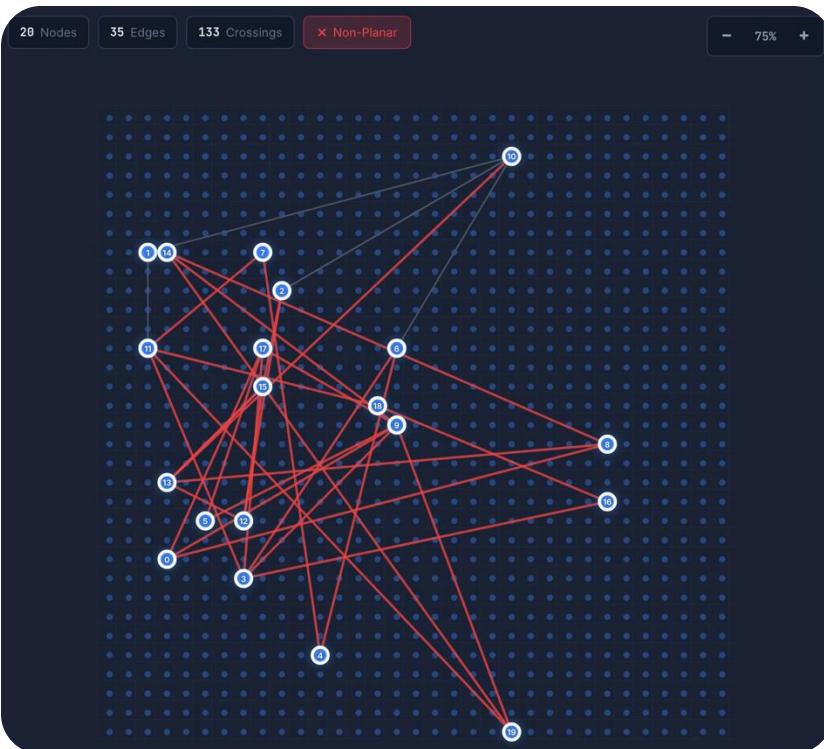


# SIMPLE MATH

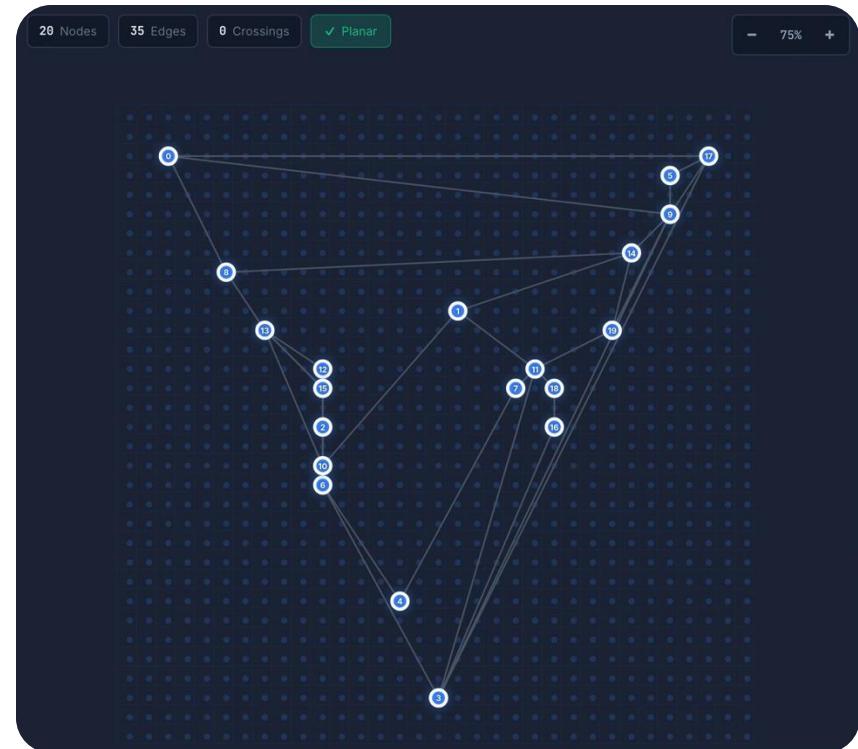
Kuratowski's and  
Wagner's Theorem

# OUR SOLUTION

## A Planarity Checker



- 20 Nodes
- 35 Edges



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# POSSIBLE REAL WORLD APPLICATIONS

- Electronic Design Automation (EDA): VLSI & Circuit Layout
  - Geographic Information Systems (GIS) & Cartography
  - City Infrastructure Planning
  - Neuromorphic Hardware
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# LIVE DEMONSTRATION

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# FUTURE UTILIZATIONS

- Network Security & IT : Fixing “Spaghetti Diagrams”
  - Circuit Designers : Finding Bottlenecks
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**THANK YOU FOR LISTENING?  
ANY QUESTIONS?**

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