Metropolis

A modern beamer theme

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Center for modern beamer themes

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Simple Proofs

Irrationality of $\sqrt{2}$

Theorem

The square root of two is irrational.

The following proof uses the *fundamental theorem of arithmetic*.

Proof

For the sake of contradiction, assume that $\sqrt{2}$ is rational. Hence, there are integers $m, n \neq 0$ such that $\sqrt{2} = \frac{m}{n}$ or rather $\sqrt{2} \cdot n = m$. Squaring both sides yields $2 \cdot n^2 = m^2$. Clearly a contradiction. ■

Complexity Theory

Turing (Cook) Reductions

Recall that SAT and TAUT are **NP**-complete and **coNP**-complete, respectively.

Theorem

NP and **coNP** are indistinguishable under Cook reductions.

Proof

We show that $\text{SAT} \leq_C \text{TAUT}$ and then $\text{TAUT} \leq_C \text{SAT}$. Let φ be a formula. Note that

1. φ is satisfiable *iff* $\neg\varphi$ is not a tautology.
2. φ is a tautology *iff* φ is satisfiable and $\neg\varphi$ is not.

Hence, the respective oracles can be used as follows:

```
1: procedure SAT(φ)
2:     return ¬TAUT(¬φ)
```

```
1: procedure TAUT(φ)
2:     return SAT(φ) ∧ ¬SAT(¬φ)
```

■

Graph Properties

Petersen Graph $P_{7,2}$

Consider the generalized Petersen graph $P_{7,2}$:

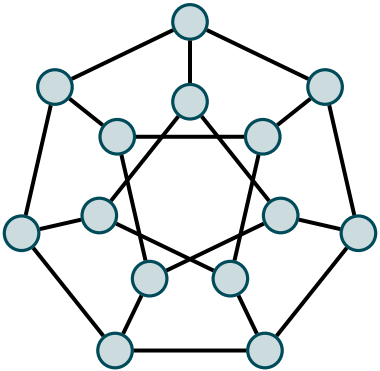
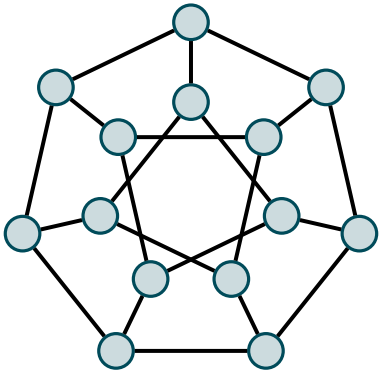


Figure 1: The Petersen graph $P_{7,2}$

Petersen Graph $P_{7,2}$: Properties

Consider the generalized Petersen graph $P_{7,2}$.

It is

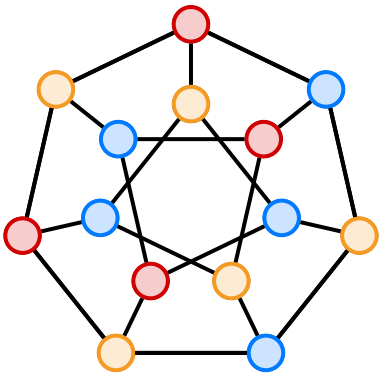


Petersen Graph $P_{7,2}$: Vertex Coloring

Consider the generalized Petersen graph $P_{7,2}$.

It is

- 3-colorable,

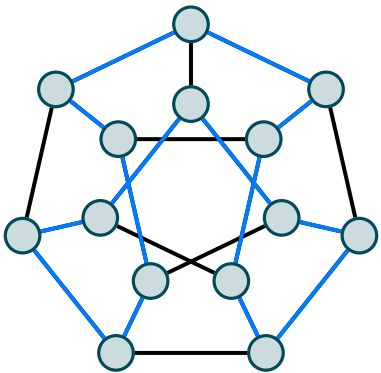


Petersen Graph $P_{7,2}$: Hamiltonicity

Consider the generalized Petersen graph $P_{7,2}$.

It is

- 3-colorable,
- Hamiltonian,

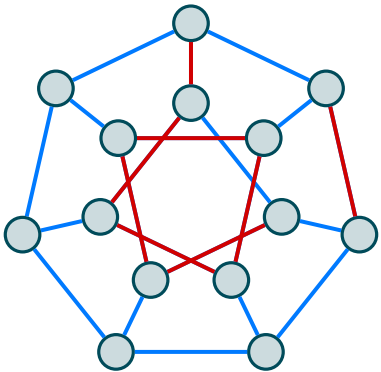


Petersen Graph $P_{7,2}$: Arboricity

Consider the generalized Petersen graph $P_{7,2}$.

It is

- 3-colorable,
- Hamiltonian,
- 2-arboric.



Conclusion

Summary

Get the source of this theme and the demo presentation from

`github.com/m3g33/blue-mtheme`

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Questions?

Backup slides

Sometimes, it is useful to add slides at the end of your presentation to refer to during audience questions.

The best way to do this is to include the `appendixnumberbeamer` package in your preamble and call `\appendix` before your backup slides.

METROPOLIS will automatically turn off slide numbering and progress bars for slides in the appendix.

References i

[1] T. Tantau.
The BEAMER class.