**Note:** The textbook problems have been made into worksheets that are uploaded to Canvas.

**\*EXAM 1 Topics:** Discussions 1a–4, Homeworks 1-4

| **Big Topic** | **Sub Topic** | **Rosen Section** | **Problems** | **Topic Videos** |
| --- | --- | --- | --- | --- |
| **Logic** | Propositional Logic | 1.1 | 3, 5, 13, 19, 21, 25, 35 |  |
| Apps of Propositional Logic | 1.2 | 3, 7, 9, 21, 39 | [Exercise 3.1](https://www.youtube.com/watch?v=wIJojY0BAdg) |
| Propositional Equivalences | 1.3 | 1, 5, 7, 11, 27, 65 | [Proving Statements are Equivalent](https://www.youtube.com/watch?v=ta5weFXzke8)  [Tautology, Contradiction, and Satisfiable](https://www.youtube.com/watch?v=788rsO6vVLw) |
| Predicates & Quantifiers | 1.4 | 9, 13, 35, 41, 61, 63 | [Predicate Logic Translation](https://www.youtube.com/watch?v=cfAhsQJ3a40) |
| Nested Quantifiers | 1.5 | 3, 9, 11, 25, 27, 31, 39 | [Nested quantifiers problem](https://www.youtube.com/watch?v=g3tRXZO393U)  [Lec 4 Exercise 1](https://www.youtube.com/watch?v=awWpbfo4k0s)  [English to Logic Translations](https://www.youtube.com/watch?v=HeLKpNIYkGo) |
| **Proofs** | Proof Methods | 1.7 | 9, 11, 15, 27, 31, 35, 43 | [Example proof by cases](https://www.youtube.com/watch?v=RvTEGWUuJ1U)  [Proof by contradiction example](https://www.youtube.com/watch?v=SRV_0dxRbRw) |
| 1.8 | 3, 5, 19, 23, 31 |
| 4.3 | 11, 13, 15, 17, 49 |

**\*Exam 2 Topics:** Discussion/Homework 4-7

| **Big Topic** | **Sub Topic** | **Rosen Section** | **Problems** | **Topic Videos** |
| --- | --- | --- | --- | --- |
| **Induction** | Mathematical Induction | 5.1 | 1, 5, 7, 15, 17, 23, 25, 33, 41, 59, 63 | [Mathematical induction example (with inequalities)](https://www.youtube.com/watch?v=-sEoFxzbW1s) |
| Strong Induction | 5.2 | 1, 3, 5, 7, 13, 25, 29 | [Mathematical vs strong induction](https://www.youtube.com/watch?v=Ohk4bF1cNHY)  [Strong Induction Example, Question (5.2.12)](https://www.youtube.com/watch?v=rjiUzMDzzSQ)  [Strong induction postage stamps problem](https://www.youtube.com/watch?v=4x14D8mtiwE) |
| **Recurrence Relations** | Recurrence Relations | 8.1 | 3, 4, 7, 9, 11, 13, 15, 17, 19 | [Coming up with recurrence relation from story problem](https://www.youtube.com/watch?v=Y3s5HQw2XLc&list=PLKaGVDe8735h4NyN4Y0hzs3SnRoegfC8K&index=5) |
| **Modular Arithmetic** | Divisibility & Mod Arithmetic | 4.1 | 5, 7, 17, 21, 27, 31, 41, 47 | [Some modular arithmetic](https://www.youtube.com/watch?v=fCkmSrXtLHI) |
| **Sets** | Sets Intro | 2.1 | 11, 13, 19, 21, 23, 29, 33, 35, 37, 41 | [Inclusion-exclusion exercise](https://www.youtube.com/watch?v=T9yxqB0J0JU) |
| Set Operations | 2.2 | 1, 3, 15, 17, 21, 25, 41 | [Power set exercise](https://www.youtube.com/watch?v=muGXIb7QnK0)  [Proving two sets are equal (by showing that each side is a subset of the other)](https://www.youtube.com/watch?v=qrdt1FqwUH4) |
| **Functions** | Functions | 2.3 | 1, 15, 23, 29, 33, 35, 41 | [Function Intuition - Basics of Functions, Onto and One-to-One](https://www.youtube.com/watch?v=94wdeVjDUYs)  [Functions one-to-one & onto proofs](https://www.youtube.com/watch?v=6usqhOpfxDk)  [Function Composition Practice](https://www.youtube.com/watch?v=XIt68SfY5yg)  [Function mapping, onto, and one-to-one exercise](https://www.youtube.com/watch?v=C_7O2AMRIOQ) |

**\*Exam 3 Topics:** Discussion 8a-11, Homework 8-10

| **Big Topic** | **Sub Topic** | **Rosen Section** | **Problems** | **Topic Videos** |
| --- | --- | --- | --- | --- |
| **Graphs** | Graph Definition (Directed, simple, multigraph) | 10.1 | 1, 11, 23, 29 | Note about 10.8: Chromatic number = least number of colors to color a graph  [Bipartite Graphs Exercise](https://www.youtube.com/watch?v=2MF6sM880XQ)  ^^^ this is the only graphs video we have |
| Degrees, Handshake, Special Graphs, Bipartite, Subgraph | 10.2 | 9, 15, 19, 23, 24, 37(skip d), 39(skip d), 41, 43, 55, 63, 65, 67 |
| Graph Coloring | 10.8 | 5, 7, 9, 11, 13, 15, 23 |
| Graph Isomorphisms | 10.3 | 39, 41, 43, 45, 47, 49, 61, 65, 67, 69, 71, 73 |
| Paths & Connections | 10.4 | 1, 5, 6, 29 |
| Euler & Hamiltonian Paths | 10.5 | TBA |
| Trees | 11.1 | 1, 17, 47 |
| 11.4 | 1, 7(skip b&c), 11a,d |
|  | Indicator Variables |  | Not in book | [All About Expected Value](https://www.youtube.com/watch?v=eBRtXonTEaU) |
| **Time Complexity** | Time Complexity (Big O) | 3.2 | 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 35, 37, 41 | [Determining Big O of Functions](https://www.youtube.com/watch?v=WUhWOSXyFoY&list=PLKaGVDe8735h4NyN4Y0hzs3SnRoegfC8K&index=1) |
| Complexity of Algorithms | 3.3 | 1, 2, 3, 4, 6, 9, 11 | [Analyzing complexity of algorithms](https://www.youtube.com/watch?v=x-vEn-bvYK8&list=PLKaGVDe8735h4NyN4Y0hzs3SnRoegfC8K&index=4)  **\*Note:** We will not ever ask you to write your own pseudocode. |
| Divide and Conquer, Master Theorem | 8.3 | 11, 13, 17, 19, 21, 35, 37 | [Master Theorem Practice](https://www.youtube.com/watch?v=WO97XqBsL80&list=PLKaGVDe8735h4NyN4Y0hzs3SnRoegfC8K&index=3) |