

Partial Answer Key for Review Guide M122 3rd Exam Wednesday, April 15th

1. a) See text page 265 (Expressed as a rule of inference ...)
b) In this rule proving $P(1)$ is called the Basis Step
c) Proving $P(k) \rightarrow P(k+1)$ is called the Inductive Step
d) $P(k)$ is called Induction Hypothesis.

2. See notes from class.

3. Use mathematical induction to prove that
 $2^0 + 2^1 + \dots + 2^n = 2^{n+1} - 1$

See induction worksheet or Example 3 in text.

4. a) See example 4, page 452
b) 1, 1, 2, 3, 5, 8, 13, etc.

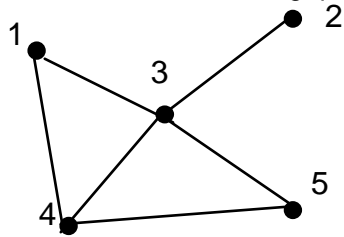
5. For the recurrence relation $a_n = 2a_{n-1} - a_{n-2}$, where
 $a_1 = 4, a_2 = 8$

a) Evaluate $a_3 = 12$ $a_4 = 16$

b) Show this by substituting into the recurrence relation – as in example 2, page 250

6. a) $a_n = n(a_{n-1})$
b) Oops -- same as 4a
c) $a_n = 3(a_{n-1})$

12. Answer the following questions for the graph below:



- a) Simple
b) 4
c) No Edges 1-3 and 4-3 require 1 and 4 to be in the same vertex set – but there is an edge from 1-4 which is a violation.

14. a)
Isomorphism: 1 to b, 2 to c, 3 to d, 4 to a would be one isomorphism.

b) First graph has more edges than the second.

15. For the graph in question 12:

- a) 1-3-4-1
b) Yes
c) cut vertex: 3 cut edge: (2,3)

16. b) i) is valid; ii) is not

17. a) Will have an Euler Circuit (every vertex has even degree)

b) A-B-D-C-F-E-A

18. transitive, antisymmetric, irreflexive

19. Draw the **directed** graph for the relation on the set of integers $\{1,2,3,4\}$ represented by the adjacency matrix:

$$\begin{array}{cccc} & 1 & 2 & 3 & 4 \\ \begin{array}{l} 1 \\ 2 \\ 3 \\ 4 \end{array} & \left(\begin{array}{cccc} 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{array} \right) \end{array}$$

b) symmetric, irreflexive,