

NAME: _____

1. Prove that:

$$\sum_{i=0}^n 4^i = \frac{4^{n+1} - 1}{3}$$

2. Multiply the following matrices.

$$\begin{pmatrix} 2 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 0 & 2 & 0 & 3 \\ 3 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{pmatrix}$$

3. Combine the following permutations as indicated. Remember that $(f \circ g)(x) = f(g(x))$.

$$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 4 & 5 & 1 \end{pmatrix} \circ \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 1 & 5 & 4 & 3 \end{pmatrix}$$

4. Which of the following are propositions?

_____ a. If $1+2=2$ then $b = c$

_____ b. I like pancakes.

_____ c. Give me liberty or give me death!

_____ d. $A < B$ and $B < C$

_____ e. Jeremy is either a communist or a very good imitation.

_____ f. What is the square root of 4?

_____ g. If you want to go to Boston then you've got to fly in a plane.

_____ h. I don't want to go to Boston.

_____ i. Rubber baby buggy bumpers.

_____ j. Go ahead, Make my day!

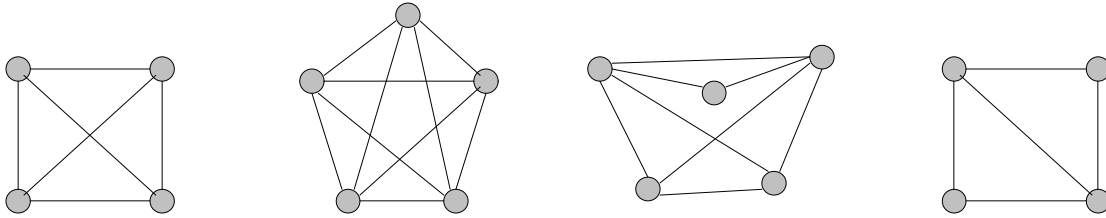
5. Prove the following statement.
If $A \subseteq B$ then $A \cap B = B$

6. Define the following terms with respect to graphs.
- Path
 - Cycle
 - Simple Path
 - Connected Graph
 - Adjacent vertices

7. I have three sacks containing colored balls. Sack 1 has three red balls, two blue balls, and one white ball. Sack 2 has two red balls and six green balls. Sack 3 has four red balls two white balls, one yellow ball and one black ball. If I choose one ball from each of the sacks, what is the probability that all three balls are red? What is the probability that none of the balls are red? What is the probability that two of the balls are white?

8. In the polynomial $(x+1)^9$, what is the coefficient of x^7 ?

9. Which of the following graphs have Euler paths, which of them have Euler cycles, and which of them have neither?



10. In the list of all permutations of the letters ABCDE, what follows AEDCB? In the list of all combinations of three letters from the set ABCDEF, what follows AEF?