Name _____ Discrete II, Big Quiz 1, Spring 2017

Please show all your work and circle your answer when appropriate. You do not need to simplify answers unless the problem specifies to do so.

1) Given $f(n) = n^3 + 3n^2 + n\log(n)$, find a big-Oh notation that gives an asymptotic upper bound for $f(n)$. (3 points)

2) Given $f(n) = n^3 + 3n^2 + n\log(n)$, find a big-Omega (Ω) notation that gives an asymptotic lower bound for $f(n)$. (3 points)

3) Justify the claim that $3n^2 + n$ is $O(n^2)$. (4 points)

4) How many 12-letter strings can be formed from the letters A, B, C, and D? (3 points)

5) Suppose a bag of letters has 4 A's, 3 B's, 3 C's, and 2 D's. How many 12 letter strings can be formed from these letters? (3 points)

6) Solve the equation below for x_1, x_2, x_3, and x_4. Each variable must be a positive integer. Note that a number is positive if it greater than zero. (4 points)

$$x_1 + x_2 + x_3 + x_4 = 16$$

7) Find the coefficient of x^7 in the expression $(2y - x)^{70}$. (4 points)

8) You are dealt 5 cards from a standard deck of 52 cards. What is the probability you do not get a flush? (A flush is when all your cards are the same suit, such as five spades) (4 points)

9) Find the general solution to the recurrence relation given by $a_n = 3a_{n-1} + 10a_{n-2}$. (4 points)

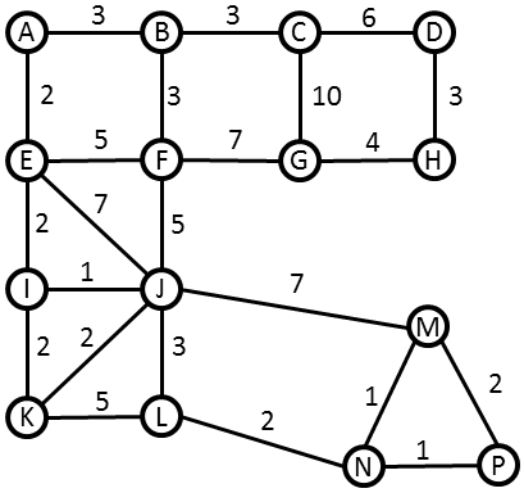
10) In Dijkstra's algorithm on an arbitrary graph, give and explain a lower bound for the total number of times an implementation of the algorithm would have to load a vertex to the computer's processor. (4 points)

Use the graph below to solve these problems.

11) Give an example of a path between A and L. (2 points)

12) Give an example of a cycle through A. (2 points)

13) What vertex has the largest degree? (2 points)



14) Run Dijkstra's algorithm on the graph to find the shortest path between A and P. Illustrate your work on the graph itself. (8 points)