MATH 111 - STUFF TO KNOW FOR THE EXAM

You should know how to ...

Linear Functions, System of Linear Equations, Matrices

- find the slope of the line between two points, find the equation of a line given two points or the slope and one point, graph the equation of a line
- use a linear function to model a word problem, set up cost, revenue, and profit functions, solve for break-even point, find marginal and fixed costs
- write the augmented matrix corresponding to a system of linear equations
- solve a system of equations using the Gauss-Jordan method, perform row operations and in what order to put a matrix into reduced row-echelon form
- recognize when a system has no solution or an infinite number of solutions, use a parameter to describe an infinite set of solutions
- use a system of linear equations to model a word problem
- add, subtract, and multiply matrices, solve applications involving matrix multiplication
- calculate the inverse of a matrix, write down the matrix equation $AX = B$ corresponding to a system of equations, solve a square system using the inverse matrix (if $AX = B$ then $X = A^{-1}B$)
- write an input-output matrix, given gross production amounts find amounts used internally and leftover (demand), given demanded amounts find gross production amounts required, use the formulas $D = X - AX$ and $X = (I - A)^{-1}D$

Linear Programming

- model a word problem as a linear programming problem
- Graphical Method
  - solve an LP in two variables using the 4 step method
  - graph a linear inequality, graph a feasible region
  - calculate coordinates of a corner point
  - determine if an optimal solution exists or recognize unboundedness

- Simplex Method
  - convert any problem into standard form, add slack variables and set up the initial tableau
  - read a BFS from a tableau, decide if it is feasible, if feasible is it optimal?
  - choose a nonbasic variable to increase (moving to the feasible region or increasing objective function), choose the pivot element or recognize unboundedness
  - perform the row operations to pivot
  - report the solution in the case of a minimization problem

Sets, Probability, Counting

- solve Venn diagram problems, find union, intersection, and complement of sets, use the union formula: $n(A \cup B) = n(A) + n(B) - n(A \cap B)$
- calculate probability using the basic formula: $P(E) = n(E)/n(S)$
- use the multiplication principle to solve counting problems
- calculate permutations and combinations, tell the difference between a permutation and a combination, use permutations and combinations to solve counting problems
- use the Addition Rule for probability: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- decide if events are mutually exclusive (pairwise disjoint), how the Addition Rule specializes for mutually exclusive events: $P(A \cup B) = P(A) + P(B)$
- use the Complement Rule for probability: $P(A') = 1 - P(A)$
- how to calculate conditional probability: $P(A \mid B) = P(A \cap B)/P(B)$.
- how the conditional probability formula may be used to calculate the probability of events A and B both happening: $P(A \cap B) = P(A \mid B)\, P(B)$
- decide if two events are independent, tell the difference between mutually exclusive and independence, how the intersection rule specializes for independent sets: $P(A \cap B) = P(A)\, P(B)$
- solve conditional probability problems with tree diagrams