Applying Newton's Laws

The following procedure is recommended when dealing with problems involving Newtons laws:

- Draw a simple, neat diagram of the system to help *conceptualize* the problem.
- *Categorize* the problem:
  - If any acceleration component is zero, the particle is in equilibrium in this direction and $\Sigma F = 0$.
  - If not, the particle is undergoing an acceleration, the problem is one of nonequilibrium in this direction, and $\Sigma F = ma$.
- *Analyze* the problem by isolating the object whose motion is being analyzed. Draw a free-body diagram for this object.
  - For systems containing more than one object, draw *separate* free-body diagrams for each object.
  - *Do not* include in the free-body diagram forces exerted by the object on its surroundings.
- Establish convenient coordinate axes for each object and find the components of the forces along these axes. Apply Newtons second law, $\Sigma F = ma$, in component form. Check your dimensions to make sure that all terms have units of force.
- Solve the component equations for the unknowns. Remember that you must have as many independent equations as you have unknowns to obtain a complete solution.
- *Finalize* by making sure your results are consistent with the free-body diagram. Also check the predictions of your solutions for extreme values of the variables. By doing so, you can often detect errors in your results.