Physics 261: Math Session

- No notebook today — just follow the marching orders here.
- Start by reminding yourself how Solve[ ] works, and explain to your neighbor what a "substitution rule" is. Maybe solve a quadratic eqn.
- Exercise your mastery of these concepts by working through the set of eqns on the homework's worksheet:
  - First define the 4 eqns (e.g., eqnA = \( T - \mu mg = m_1 x_1 \)).
  - Then Solve[ ] atomically for \( x_1, x_2, y_3, T_3 \).
  - Then follow the steps on the worksheet, i.e., Solve[ ] eqnA for \( x_1 \), and plug back into eqnD to obtain eqnDF (aka d').
  - Similarly use eqnB & eqnC to eliminate \( x_2, y_3 \) to obtain equation \( d'' \).
  - Solve for \( T \). Useful incantations: Solve[eqn, x][EIJ]
- Print out these cells and hand in with the homework. If you need to AddAPrinter, ask.

- Use Solve to find \( f \) and \( \theta \) in the following situation.

  \[
  \begin{align*}
  \text{Forces: } & \quad T \quad \Rightarrow \quad x: \quad ma = \? \\
  & \quad f \quad \Rightarrow \quad y: \quad m_0 = \? 
  \end{align*}
  \]

  - Complete the equations at right and Solve for \( f \& \theta \).
  - Then given we are at the extreme positive acceleration where \( f = \mu N \),
  
  Solve for the maximal acceleration before the block slips.
  - Likewise suppose we seek the minimal acceleration (when \( f \) will pull up the ramp);
  
  make the eqns appropriately and Solve again.

  - No requirement to print this out, but you may choose to if you like.

- Morin asks for \( x(t) \) given that \( x(0) = 0, \dot{x}(0) = 0 \) and \( x(t) = a_0 e^{-bt} \).

  - Use Integrate[ ] to find \( v(t) \), and the Integrate[ ] that result to find \( x(t) \).

  - Use DSolve[ ] to do the same thing:

  \[
  \text{DSolve}[\{x''[t] = a_0 \text{Exp}[-bt], x[0] = 0, x[0] = 0\}, x[t], t]\]

  \[\text{two primes, not a quotation mark}\]

  \[\text{not } t, \text{ just } t \]

  \[\text{remember the special time } 0 \text{ these are } = 0 \text{ not } 0 = t \text{ just } \]

- Here are two equations we will DSolve next week:

  \[
  \begin{align*}
  m \ddot{x} &= -kx \\
  m \ddot{y} &= -am\dot{x} - mg \\
  \end{align*}
  \]

  Try them now if you like, and even Plot or ParametricPlot the results.