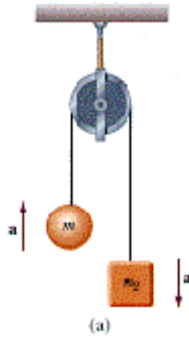# Lab #4, Newton's 2nd Law                                    Worksheet

The figure represents a typical Atwood's Machine in which two masses are connected by a light string and then suspend over a massless, frictionless pulley. Complete each of the indicated steps to derive an equation that represents the predicted acceleration of the system.



(a)

1. Consider each mass as a separate object and draw a free body diagram for each. Note that all forces act in the *y*-direction.

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**Free Body Diagrams**                    $m_1$                    $m_2$

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2. Write $\sum F_y = ma_y$ for each of the masses to obtain two linear equations that include the acceleration of each mass.

   **$m_1$:**                                    **$m_2$:**

3. Solve the resulting system of linear equations to obtain a predicted value for $a_y$. Note that the masses are constrained to move together so $\left|a_{1y}\right| = \left|a_{2y}\right| = \left|a_y\right|$.