Quiz 5-6 (Take-home)
Physics 2010, Adam Johnston

As always, show all your work and circle your final answer (both numerical and multiple choice). All numeric values are good to 3 significant figures. For this take-home quiz, you may refer to notes, your text, or your homework.

1. [3 pts] The velocity of an object is constant, upwards at 10.0 m/s. You can safely conclude that

A. there are no external forces acting on the object.  B. the net force on the object is zero.  C. both A & B  D. neither A nor B

2. [3 pts] A Ferris wheel rider is going around and around in a vertical circle. While moving at the top of this ride, the magnitude of the "normal force" acting on this rider from underneath is

A. equal to the weight of the rider.  B. greater than the weight of the rider.  C. less than the weight of the rider.  D. More information is needed to compare these forces.

3. [3 pts] Three masses are moving from left to right with a positive (to the right) acceleration across a rough (with friction) table, attached to one another by strings (as shown). Which of the strings (labeled A, B, C) has the greatest amount of tension in it?

A. The left string  B. The middle string  C. The right string  D. All tensions are the same

4. [11 pts] In your nightmares, you often dream about physics scenarios involving inclined planes, pulleys, string, and other physics phenomena. In your most recent dream, you (m=70.0 kg) are inside an elevator, standing on a scale (coefficient of static friction \( \mu_s = 0.200 \); coefficient of kinetic friction \( \mu_k = 0.0500 \)), with your hand grasping a string that is pulled tight at a 55.0° angle from the ceiling. The elevator is heading upwards with a constant velocity of 10.0 m/s. What is the minimum value that the scale will read if you are not sliding off it? (Hint: Start by drawing all of the forces and set up equations representing Newton's 2nd law in the x and y directions separately.)

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\begin{align*}
N + T \cos 55^\circ - \mu_k N &= mg \\
N + T \sin 55^\circ - mg &= 0 \\
N &= mg - T \sin 55^\circ
\end{align*}
\]

So: \( N = mg - \mu_k N (\cos 55^\circ) \)
\( N(1 + \mu_k \tan 55^\circ) = mg \)
\( N = \frac{mg}{1 + \mu_k \tan 55^\circ} = 534 N \)