Short Answer
(5 Points Each)

1. A dog starts under the shade of a large elm tree in an otherwise empty field. It walks 4.60 m due East and then walks 5.40 m in a direction that is $42.0^\circ$ North of East. Sketch a picture of the dog’s journey and determine its final distance from the elm tree.

2. A construction worker slides a 63.0 kg crate over a concrete surface by exerting a perfectly horizontal pushing force of 260 N on it. The worker and the create move at constant velocity. What is the coefficient of kinetic friction between the crate and the concrete?

3. A baseball is dropped from the top of a parking garage. What is the height of the parking garage if it takes $t = 1.65$ s to hit the ground?
Multiple Choice
(5 Points Each)

1. Alice and Terry each throw a baseball directly up into the air. If Alice throws her ball with twice the initial speed of Terry’s ball, how much higher will her ball travel? Ignore air resistance.

(a) Twice as high
(b) Three times as high
(c) Four times as high
(d) Not enough information provided

2. When you stand inside an elevator that is accelerating upwards, what is the force that causes your body to accelerate up along with the elevator?

(a) The static friction force from the elevator
(b) The tension from the elevator cable
(c) The normal force from the elevator floor
(d) None of the above

3. The gravitational acceleration on the surface of the Moon is 1.63 m/s². If an object has a weight of 85.0 N on the Moon, what would its weight be back on Earth?

(a) 511 N
(b) 833 N
(c) 85.0 N
(d) None of the above
4. The coefficient of static friction between a 38.0 kg block of marble and the flat, horizontal surface it rests on is $\mu_s = 0.325$. A man gives the block a gentle push that is not enough to move the block. What is the magnitude of the static friction force on the block during the push?

(a) 121 N  
(b) 372 N  
(c) 12.6 N  
(d) Not enough information provided

5. A projectile is launched into the air such that its speed at the highest point in its trajectory is one third its initial speed. At what angle above the horizontal was it launched?

(a) 19.5°  
(b) 37.4°  
(c) 70.5°  
(d) None of the above
Problems
(20 Points Each)

1. An unfortunate skier is skiing down a mountain when he suddenly arrives at the edge of a cliff. The skier flies right over the edge with an initial velocity $v_0$ in a direction that is an angle $\theta$ below the horizontal. The skier lands at a spot that is a horizontal distance $\Delta x$ from the base of the vertical cliffside. Determine the height of the cliff.
2. A man pushes a crate with mass $M$ across a room. The man pushes the crate with a force of magnitude $F$ that is directed diagonally upwards so that it makes an angle $\theta$ above the horizontal. The coefficient of kinetic friction between the crate and the floor is $\mu_k$. Assuming the crate starts at rest, determine how long the man must push the crate in this manner before the crate reaches a speed $v_f$. 
3. A block of mass $M_1$ rests on an incline angled $\theta$ above the horizontal. At the bottom of the incline is an abrupt, vertical drop-off. The block is connected to a string that wraps around a pulley at the bottom of the incline and is attached to a second block of mass $M_2$ at its other end. This second block hangs over the dropoff. A picture for this system is shown below. The blocks are initially held in place and upon being released begin to move, i.e. the first blocks begins to slide down the incline. Determine the tension in the string that connects the two blocks if the coefficient of friction between the first block and the incline is $\mu_k$. 

![Diagram of the system with blocks and pulley](image.png)