1. A 10 lb particle has forces of $F_1 = (3i + 5j)$ lb and $F_2 = (-7i + 9j)$ lb acting on it. Determine the acceleration of the particle. (20%)

   A) $(-0.4\,i + 1.4\,j)$ ft/s^2 B) $(-4\,i + 14\,j)$ ft/s^2

   C) $(-12.9\,i + 45\,j)$ ft/s^2 D) $(13\,i + 4\,j)$ ft/s^2

2. When the potential energy of a conservative system increases, the kinetic energy _____. (20%)
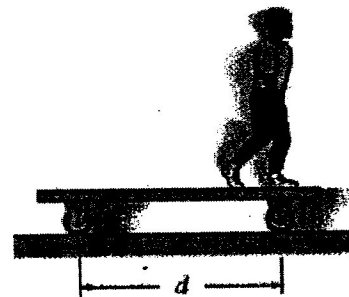
   A) always decreases.   B) always increases.

   C) could decrease or increase.   D) does not change.

3. A boy of 50 kg walks forward over the surface of the cart of 30 kg with a constant speed 1 m/s relative to the cart for 2 m. Determine the cart's speed and its displacement at the moment he is about to step off. Neglect the mass of the wheels and assume the cart and boy are originally at rest. (30%)

4. The disk of 80 kg and $r = 1.5$ m is supported by a pin at A. If it is released from rest from the position shown, determine the initial horizontal and vertical components of reaction at the pin. (30%)