Physics 2314, Midterm I (2/7)

M1 A particle moves along the x axis. Its position is given by the equation

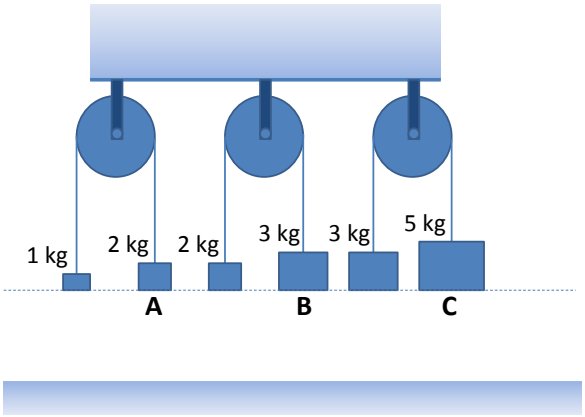
$$x = -3 - t + t^2,$$

where x is in meters and t is in seconds. At $t = 1$ s, the particle velocity is

A. positive and increasing.
B. negative and increasing.
C. positive and decreasing.
D. negative and decreasing.

M2 Three pairs of blocks of various masses as shown below are held at the same height and then simultaneously released. Which of the blocks will reach the ground first?

A. A
B. B
C. C
D. A and B first, then C
E. all at the same time



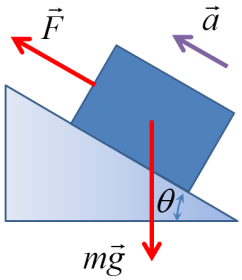
M3 An object is lying on a horizontal surface. If the coefficient of static friction between the object and the surface is 1.0, the coefficient of kinetic friction is 0.8, and the weight of the object is 10 N, the friction force cannot exceed

A. 2 N
B. 8 N
C. 10 N
D. 18 N
E. there is no limit

M4 If the initial speed of a projectile is increased by a factor of 2, the projectile range

A. increases by a factor of 4.
B. increases by a factor of 2.
C. remains the same.
D. decreases by a factor of 2.
E. decreases by a factor of 4.

P1 A 2 kg block is dragged up an incline of $\theta = 30^\circ$ with acceleration $a = 1$ m/s^2. Find the dragging force F if (a) there is no friction between the block and the incline, (b) the coefficient of kinetic friction between the block and the incline is 0.2.



P2 A projectile launched from the ground with an initial velocity of 10 m/s, lands on the ground a distance of 5.10 m from the launch location. Find the initial angle α.

P3 A 1500 kg car rounds a circular turn of radius 30 m. The road is flat and the coefficient of static friction between the tires and the road is 0.8. How fast can the car go without skidding? Hint: this is uniform circular motion where the centripetal acceleration is provided by the friction force.

P4 An object is subject to two forces $\mathbf{F}_1 = (3\mathbf{j})$ N and $\mathbf{F}_2 = (4\mathbf{i} + 2\mathbf{j})$ N. Find the net force acting on the object.