1. [10 points]
The position of a 6.11 kg mass is given by $x(t) = (3t^4 - 8t^2)$ m, for $t$ in s.

A) What is the velocity at $t = 1.37$ s?

B) What is the force experienced by this mass at $t = 0.532$ s?

2. [15 points]
A vehicle is initially moving at 29.4 m/s when the brakes are applied, slowing it to a speed of 9.7 m/s in a distance of 22.6 m. If the acceleration was constant, find

(A) the acceleration

(B) how long it took to slow down.

3. [15 points]  See diagram at right.
The 7.44 kg mass M slides down the 15.4 deg incline, traveling 0.567 m in 2.00 s after being released at rest. There is friction on the incline.

(A) What is the acceleration of M?

(B) Draw the free-body diagram for M and find the coefficient of friction.

4. [15 points]
The 3.77 kg mass is moving to the right at 2.97 m/s at point A. Friction does $-7.11$ J of work on the mass between B and C but the rest of the surface is frictionless. How high is the mass when it comes to rest on the hill?
5. [10 points]
The graph to the right shows $v(t)$ (velocity vs time in units of m/s).
What is the position $x$ at $t = 7.00$ s?
(Assume that $x = 20.0$ m at $t = 0$ s.)

6. [20 points]
A 2.51 kg mass, initially moving to the right at 9.33 m/s on a horizontal, frictionless surface, strikes a 1.62 kg mass that is attached to a spring. The force constant of the spring is 557 N/m. The two masses stick together after the collision.

(A) What is their velocity immediately after the collision?

(B) How much is the spring compressed when they come to rest?

7. [20 points]
A projectile is launched from the top of a cliff with a velocity of 19.7 m/s at $\theta = 35.2$ deg as shown in the drawing. The edge of the cliff is 27.2 m above the ground. Take the base of the cliff as the origin of your coordinate system.

(A) At what time will the projectile reach its highest point?

(B) What is its (vector) velocity at that point?

(C) What is its (vector) acceleration at that point?

(D) How high is it above the ground at that point?