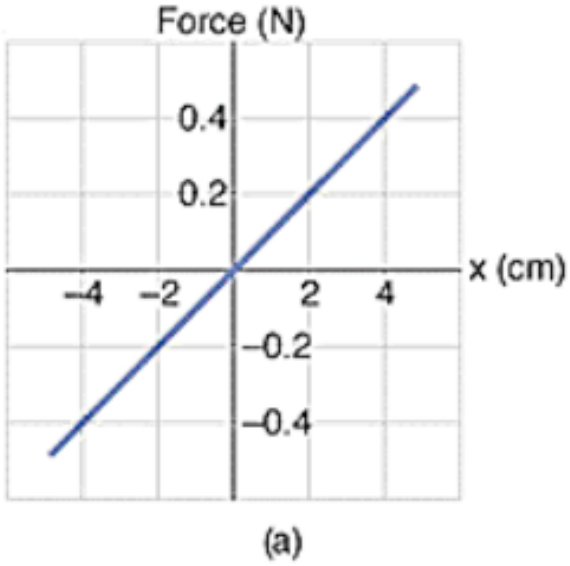
1. **Tarzan, who weighs 648 [N], swings from a cliff at the end of a vine that is 25 [m] long. From the top of the cliff to the bottom of the swing, he descends by 3.2 [m]. The vine will break if the force on it exceeds 950 [N].**

a. **What is Tarzan's velocity at the bottom of the swing?**

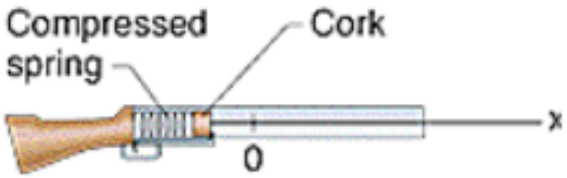
b. **What is the force on the vine at this time?**

c. **Will the vine break?**

2. **Figure (a) applies to the spring in a cork gun shown in Figure (b). The graph shows the spring force as a function of the stretch or compression of the spring. The spring is compressed by 5.5 [cm] and used to propel a 3.8 [g] cork from the gun.**
   a. **What is the speed of the cork if it is released as the spring passes through its relaxed position?**
   b. **Suppose, instead, that the cork sticks to the spring and stretches it 1.5 [cm] before separation occurs. What now is the speed of the cork at the time of release?**

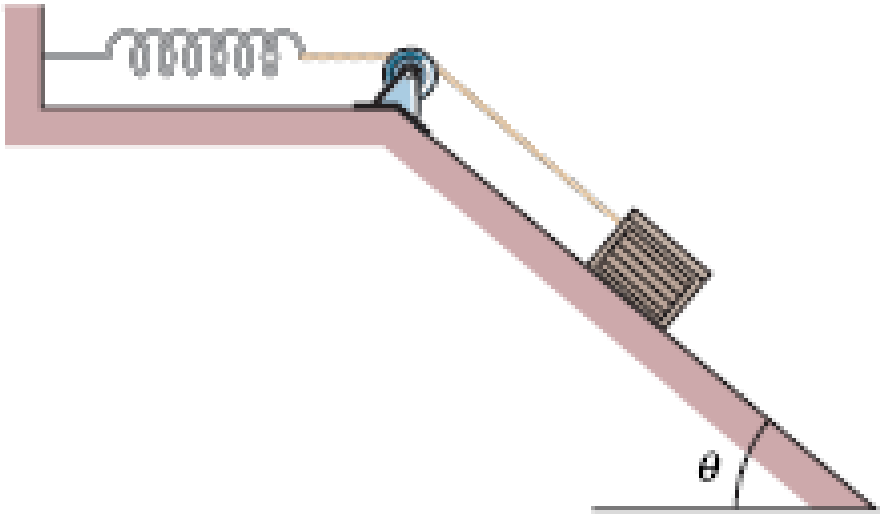


(a)



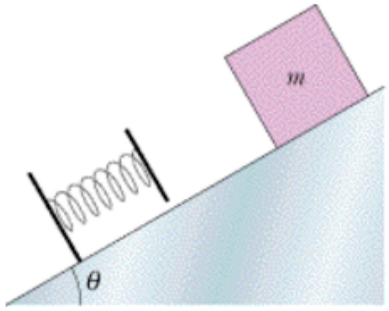
(b)

3. **A 1.7 [kg] breadbox on a frictionless incline of angle θ = 34° is connected, by a cord that runs over a pulley, to a light spring of spring constant k = 120 [N/m], as shown in the figure below. The box is released from rest when the spring is unstretched. Assume that the pulley is massless and frictionless.**
   - **a. What is the speed of the box when it moves 0.12 [m] down the incline?**
   - **b. How far down the incline from its point of release does the box slide before momentarily stopping?**
   - **c. What is the magnitude and the direction of the box's acceleration at the instant the box momentarily stops?**



4. **A 29 [kg] bear slides, from rest, 13 [m] down a pine tree, moving with a speed of 5.8 [m/s] just before hitting the ground.**
   - **a. What is the change in the gravitational potential energy of the bear just before hitting the ground?**
   - **b. What is the kinetic energy of the bear just before hitting the ground?**
   - **c. What is the average frictional force that acts on the bear?**

5. **In the figure below, a block of mass m = 3.20 [kg] slides from rest a distance d down a frictionless incline at angle θ = 30.0° where it runs into a spring of spring constant k=420 [N/m]. When the block momentarily stops, it has compressed the spring by 0.19 [m].**



a. **What is the distance d?**
b. **What is the distance between the point of first contact and the point where the block's speed is greatest?**

6. **You push a 1.9 [kg] block against a horizontal spring, compressing the spring by 0.12 [m]. Then you release the block, and the spring sends it sliding across a tabletop. It stops 0.80 [m] from where you released it. The spring constant is 200 [N/m]. What is the coefficient of kinetic friction between the block and the table if it experiences friction for the entire duration of its movement?**

7. **The velocity of a particle moving along the x-axis is given as a function of time by the expression $v(t) = 3t^3 - 6t - 1$ where x is in meters and t is in seconds.**
a. **At what time is the acceleration of the object 0 [m/s^2]?**
b. **What is the velocity of the particle at this time?**

8. **The position of an object is moving along the x-axis is given as a function of time by the expression $x(t) = 8t^3 + 4t + 1$ where x is in meters and t is in seconds. The mass of the object is 6 [kg].**
a. **What is the average velocity of the object in the time interval t = 2 [s] to t = 5 [s]?**
b. **What is the velocity of the object at t = 2 [s].**
c. **What is the acceleration of the object at t = 3 [s].**
d. **What is the force acting on the object at t = 4 [s]**

HW Set 7 Answers

1a. 7.92 [m/s]
1b. 813.90 [N]
1c. The vine does not break since the force acting on Tarzan (813.90 [N] is less than what the vine can handle (840 [N])

2a. 2.82 [m/s]
2b. 2.71 [m/s]

3a. 0.547 [m/s]
3b. 0.155 [m]
3c. 5.48 [m/s^2] up the incline

4a. -3690 [J]
4b. 488 [J]
4c. 247 [J]

5a. 0.293 [m]
5b. 3.73 [cm]

6. 0.0967 [1]

7a. 0.82 [s]
7b. -4.27 [m/s]

8a. 316 [m/s]
8b. 100 [m/s]
8c. 144 [m/s^2]
8d. 864 [N]