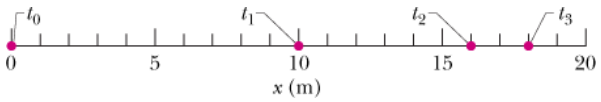
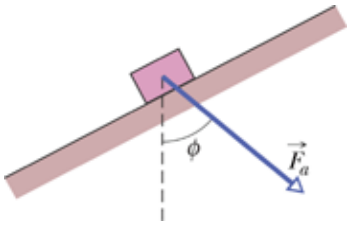
Chapter 7 – Problem Day

6. A bead with mass 1.8×10^{-2} kg is moving along a wire in the positive direction of an *x*-axis. Beginning at time *t* = 0, when the bead passes through *x* = 0 with speed 12 m/s, a constant force acts on the bead. The figure indicates the bead's position at times $t_0 = 0s$, $t_1 = 1s$, $t_2 = 2s$, and $t_3 = 3s$. The bead momentarily stops at $t_3 = 3s$. What is the kinetic energy of the bead at $t = 10s$?



15. A 12.0 N force with a fixed orientation does work on a particle as the particle moves through displacement $\vec{d} = (2m)\hat{i} - (4m)\hat{j} + (3m)\hat{k}$. What is the angle between the force and the displacement if the change in the particle's kinetic energy is (a) +30.0 J and (b) −30.0 J?

21. In the figure, a constant force $\vec{F}_a$ of magnitude 82.0 N is applied to a 3.00 kg shoebox at angle $\phi = 53°$, causing the box to move up a frictionless ramp at constant speed. How much work is done on the box by $\vec{F}_a$ when the box has moved through vertical distance $h = 0.15m$?



41. A force $\vec{F} = (cx - 3x^2)\hat{i}$ acts on a particle as the particle moves along an *x*-axis. At *x* = 0, the particle's kinetic energy is 20.0 J; at *x* = 3 m, it is 11.0 J. Find *c*.

48. (a) At a certain instant, a particle-like object is acted on by a force $\vec{F} = (4N)\hat{i} - (2N)\hat{j} + (9N)\hat{k}$ while the object's velocity is $\vec{v} = -(2m/s)\hat{i} + (4m/s)\hat{k}$. What is the instantaneous rate at which the force does work on the object? (b) At some other time, the velocity consists of only a *y* component. If the force is unchanged and the instantaneous power is −12 W, what is the velocity of the object?

Chapter 7 Answers

5a) $1+\sqrt{2}$ =2.41 m/s
5b) $2+2\sqrt{2}$ =4.82 m/s

11a) -170 N
11b) 342.25 m
11c) -58,182.5 J
11d) -340 N
11e) 171.125 m
11f) -58,182.5 J

16) 15.3 J

19a) $-\frac{3}{4}Mgd$
19b) Mgd
19c) $\frac{1}{4}Mgd$
19d) $\sqrt{\frac{1}{2}gd}$

24a) 8840 J
24b) 7840 J
24c) 6840 J

26) 1250 J

32a) 8 N
32b) 8 N/m

37) 528 J

42) 41.7 J

45a) 0.83 J
45b) 2.5 J
45c) 4.2 J
45d) 5 W

47) 735 W

52) $-\frac{T}{3P}dP$