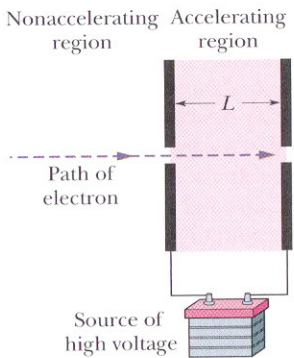


2-19
 The position of a particle moving along the x-axis depends on the time according to the equation $x = ct^2 - bt^3$, where x is in meters and t in seconds. What are the units of (a) constant c and (b) constant b ? Let their numerical values be 3.0 and 2.0 respectively. (c) At what time does the particle reach its maximum positive x position? From $t=0.0$ s to $t=4.0$ s, (d) what distance does the particle move and (e) what is its displacement? Find its velocity at times (f) 1.0 s, (g) 2.0 s, (h) 3.0 s, and (i) 4.0 s. Find its acceleration at times (j) 1.0 s, (k) 2.0 s, (l) 3.0 s, and (m) 4.0 s.

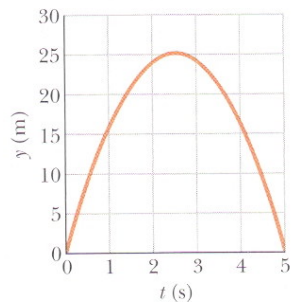
2-25
 An electron with an initial velocity $V_0 = 1.50 \times 10^5$ m/s enters a region of length $L = 1.00$ cm where it is electrically accelerated. It emerges with $V = 5.70 \times 10^6$ m/s. What is its acceleration, assumed constant? (Such a process occurred in old-fashioned television sets.)



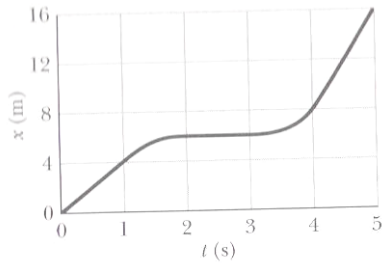
2-41
 (a) With what speed must a ball be thrown vertically from ground level to rise to a maximum height of 50 m? (b) How long will it be in the air? (c) Sketch graphs of y , v , and a versus t for the ball. On the first two graphs, indicate the time at which 50 m is reached.

2-50
 A rock is thrown vertically upward from ground level at time $t = 0$. At $t = 1.5$ s it passes the top of a tall tower, and 1.0 s later it reaches its maximum height. What is the height of the tower?

2-58
 A ball is shot vertically upward from the surface of a planet in a distant solar system. A plot of y versus t for the ball is shown, where y is the height of the ball above its starting point and $t = 0$ at the instant the ball is shot. What are the magnitudes of (a) the free-fall acceleration on the planet and (b) the initial velocity of the ball?



2-78
 A graph of x versus t for a particle in straight-line motion is shown in the figure. (a) What is the average velocity of the particle between $t = 0.50$ s and $t = 4.5$ s? (b) What is the instantaneous velocity of the particle at $t = 4.5$ s? (c) What is the average acceleration of the particle between $t = 0.50$ s and $t = 4.5$ s? (d) What is the instantaneous acceleration of the particle at $t = 4.5$ s?



2-89
 A stone is thrown vertically upward. On its way up it passes point A with speed v , and point B, 3.00 m higher than A, with speed $\frac{1}{2}v$. Calculate (a) the speed v and (b) the maximum height reached by the stone above point B.

2-115
 At the National Physical Laboratory in England, a measurement of the free-fall acceleration g was made by throwing a glass ball straight up in an evacuated tube and letting it return. Let ΔT_L in the figure be the time interval between the two passages of the ball across a certain lower level, ΔT_U the time interval between the two passages across an upper level, and H the distance between the two levels. Show that

$$g = \frac{8H}{\Delta T_L^2 - \Delta T_U^2}$$

