Extra Practice 2

Due: 2:00pm on Wednesday, February 10, 2016

You will receive no credit for items you complete after the assignment is due. Grading Policy

Exercise 2.33

A small block has constant acceleration as it slides down a frictionless incline. The block is released from rest at the top of the incline, and its speed after it has traveled 6.60 m to the bottom of the incline is 3.80 $\mathrm{m/s}$.

Part A

What is the speed of the block when it is 5.00 m from the top of the incline?

Express your answer with the appropriate units.

ANSWER:

$v =$ $8.1\ \mathrm{m/s}$

Incorrect; Try Again; 5 attempts remaining

Exercise 2.35

Part A

If a flea can jump straight up to a height of 0.360 m , what is its initial speed as it leaves the ground?

ANSWER:

$v =$ $\mathrm{m/s}$

Part B

How long is it in the air?

ANSWER:

$t =$ s

Exercise 2.37

A juggler throws a bowling pin straight up with an initial speed of 7.90 $\mathrm{m/s}$.

Part A

How much time elapses until the bowling pin returns to the juggler's hand?

Express your answer with the appropriate units.

ANSWER:

t =

Exercise 2.41

A meter stick is held vertically above your hand, with the lower end between your thumb and first finger. On seeing the meter stick released, you grab it with these two fingers. You can calculate your reaction time from the distance the meter stick falls, read directly from the point where your fingers grabbed it.

Part A

If the measured distance is 19.0 cm , what is the reaction time?

ANSWER:

t = s

Exercise 2.43

A 7500 kg rocket blasts off vertically from the launch pad with a constant upward acceleration of 2.35 $\mathrm{m/s^2}$ and feels no appreciable air resistance. When it has reached a height of 515 m , its engines suddenly fail so that the only force acting on it is now gravity.

Part A

What is the maximum height this rocket will reach above the launch pad?

ANSWER:

y_{max} = m

Part B

How much time after engine failure will elapse before the rocket comes crashing down to the launch pad?

ANSWER:

t = ____ s

Part C

How fast will it be moving just before it crashes?

ANSWER:

v = ____ $\mathrm{m/s}$

Exercise 2.45

The rocket-driven sled *Sonic Wind No. 2,* used for investigating the physiological effects of large accelerations, runs on a straight, level track of length 1080 m . Starting from rest, it can reach a speed of 226 $\mathrm{m/s}$ in a time 0.875 s .

Part A

Compute the acceleration, assuming that it is constant.

ANSWER:

a = ____ $\mathrm{m/s^2}$

Part B

What is the ratio of this acceleration to that of a freely falling body?

ANSWER:

$\frac{a}{g}$ = ____

Part C

What is the distance covered in a time of 0.875 s ?

ANSWER:

y = ____ m

Part D

A magazine article states that at the end of a certain run, the speed of the sled decreased from 284 $\mathrm{m/s}$ to zero in 1.35 s and that during this time the magnitude of the acceleration was more than $40g$. Are these figures consistent?

ANSWER:

- yes
- no

Exercise 2.53

The acceleration of a motorcycle is given by $a_x(t) = At - Bt^2$, where $A = 1.50\ \mathrm{m/s^3}$ and $B = 0.120\ \mathrm{m/s^4}$. The motorcycle is at rest at the origin at time $t = 0$.

Part A

Find its velocity as a function of time. Letters A and B are not allowed in the answer.

Express your answer in terms of t.

ANSWER:

$v(t)$ =

Part B

Find its position as a function of time. Letters A and B are not allowed in the answer.

Express your answer in terms of t.

ANSWER:

$x(t)$ =

Part C

Calculate the maximum velocity it attains. Letters A and B are not allowed in the answer.

ANSWER:

$\mathrm{m/s}$

Problem 2.57

Earthquakes produce several types of shock waves. The most well-known are the P-waves (P for *primary* or *pressure*) and the S-waves (S for *secondary* or *shear*). In the earth's crust, the P-waves travel at around 6.5 $\mathrm{km/s}$ while the S-waves move at about 3.5 $\mathrm{km/s}$. The actual speeds vary depending on the type of material they are going through. The time delay between the arrival of these two waves at a seismic recording station tells geologists how far away the earthquake occurred.

Part A

If the time delay is 33 s, how far from the seismic station did the earthquake occur?

Express your answer using two significant figures.

ANSWER:

d = _____ km

Problem 2.63

A ball starts from rest and rolls down a hill with uniform acceleration, traveling 100 m during the second 4.2 s of its motion.

Part A

How far did it roll during the first 4.2 s of motion?

Express your answer to two significant figures and include the appropriate units.

ANSWER:

d = _____

Problem 2.69

The acceleration of a particle is given by $a_x(t) = -$ 2.01 $\mathrm{m/s^2}$ $+($ 3.09 $\mathrm{m/s^3}$ $)t$.

Part A

Find the initial velocity v_{0x} such that the particle will have the same *x*-coordinate at time $t =$ 4.01 s as it had at $t = 0$.

ANSWER:

v_{0x} = _____ $\mathrm{m/s}$

Part B

What will be the velocity at time t = 4.01 s ?

ANSWER:

v_x = $\mathrm{m/s}$

Problem 2.73

Sam heaves a shot with weight 16-lb straight upward, giving it a constant upward acceleration from rest of 40.1 $\mathrm{m/s^2}$ for a height 63.0 cm . He releases it at height 2.25 m above the ground. You may ignore air resistance.

Part A

What is the speed of the shot when he releases it?

ANSWER:

v = $\mathrm{m/s}$

Part B

How high above the ground does it go?

ANSWER:

h = m

Part C

How much time does he have to get out of its way before it returns to the height of the top of his head, a distance 1.87 m above the ground?

ANSWER:

t = s

Exercise 3.3

A web page designer creates an animation in which a dot on a computer screen has a position of

$\vec{r} = [\ 3.9\ \text{cm} + (\ 2.7\ \text{cm/s}^2\ )t^2]\hat{i} + (\ 4.7\ \text{cm/s}\ )t\hat{j}$.

Part A

Find the average velocity of the dot between $t = 0$ and $t = 2.0$ s.

Give your answer as a pair of components separated by a comma. For example, if you think the *x* component is 3 and the *y* component is 4, then you should enter `3 , 4`. Express your answer using two significant figures.

ANSWER:

$\vec{v}_{ave}$ = _____ cm/s

Part B

Find the instantaneous velocity at $t = 0$.

Give your answer as a pair of components separated by a comma. For example, if you think the *x* component is 3 and the *y* component is 4, then you should enter `3 , 4`. Express your answer using two significant figures.

ANSWER:

$\vec{v}$ = _____ cm/s

Part C

Find the instantaneous velocity at $t = 1.0$ s.

Give your answer as a pair of components separated by a comma. For example, if you think the *x* component is 3 and the *y* component is 4, then you should enter `3 , 4`. Express your answer using two significant figures.

ANSWER:

$\vec{v}$ = _____ cm/s

Part D

Find the instantaneous velocity at $t = 2.0$ s.

Give your answer as a pair of components separated by a comma. For example, if you think the *x* component is 3 and the *y* component is 4, then you should enter `3 , 4`. Express your answer using two significant figures.

ANSWER:

$\vec{v}$ = _____ cm/s

Exercise 3.7

The coordinates of a bird flying in the *xy*-plane are given by $x(t) = \alpha t$ and $y(t) = 3.0\text{m} - \beta t^2$, where $\alpha = 2.4\ \text{m/s}$ and $\beta = 1.2\ \text{m/s}^2$.

Part A

Calculate the velocity vector of the bird as a function of time.

Give your answer as a pair of components separated by a comma. For example, if you think the *x* component is 3t and the *y* component is 4t, then you should enter `3t,4t`. Express your answer using two significant figures for all coefficients.

ANSWER:

$\vec{v}(t) =$ _____ m/s

Part B

Calculate the acceleration vector of the bird as a function of time.

Give your answer as a pair of components separated by a comma. For example, if you think the *x* component is 3t and the *y* component is 4t, then you should enter `3t,4t`. Express your answer using two significant figures for all coefficients.

ANSWER:

$\vec{a}(t) =$ _____ m/s^2

Part C

Calculate the magnitude of the bird's velocity at $t = 2.0\text{s}$.

Express your answer using two significant figures.

ANSWER:

$v =$ _____ m/s

Part D

Let the direction be the angle, that the vector makes with the +*x*-axis measured counterclockwise. Calculate the direction of the bird's velocity at $t = 2.0\text{s}$.

Express your answer in degrees using two significant figures.

ANSWER:

θ = °

Part E

Calculate the magnitude of the bird's acceleration at $t = 2.0\text{s}$.

Express your answer using two significant figures.

ANSWER:

m/s^2

Part F

Calculate the direction of the bird's acceleration at $t = 2.0\text{s}$.

ANSWER:

θ = °

Part G

At $t = 2.0\text{s}$, is the bird speeding up, slowing down or moving at constant speed?

ANSWER:

- speeding up
- slowing down
- moving at constant speed

Exercise 3.9

A physics book slides off a horizontal table top with a speed of 1.40 m/s . It strikes the floor after a time of 0.470 s . Ignore air resistance.

Part A

Find the height of the table top above the floor.

Express your answer with the appropriate units.

ANSWER:

h =

Part B

Find the horizontal distance from the edge of the table to the point where the book strikes the floor.

Express your answer with the appropriate units.

ANSWER:

x =

Part C

Find the magnitude of the horizontal component of the book's velocity just before the book reaches the floor.

Express your answer with the appropriate units.

ANSWER:

v_{h} =

Part D

Find the magnitude of the vertical component of the book's velocity just before the book reaches the floor.

Express your answer with the appropriate units.

ANSWER:

v_{v} =

Part E

Find the magnitude of the book's velocity just before the book reaches the floor.

Express your answer with the appropriate units.

ANSWER:

v =

Part F

Find the direction of the book's velocity just before the book reaches the floor.

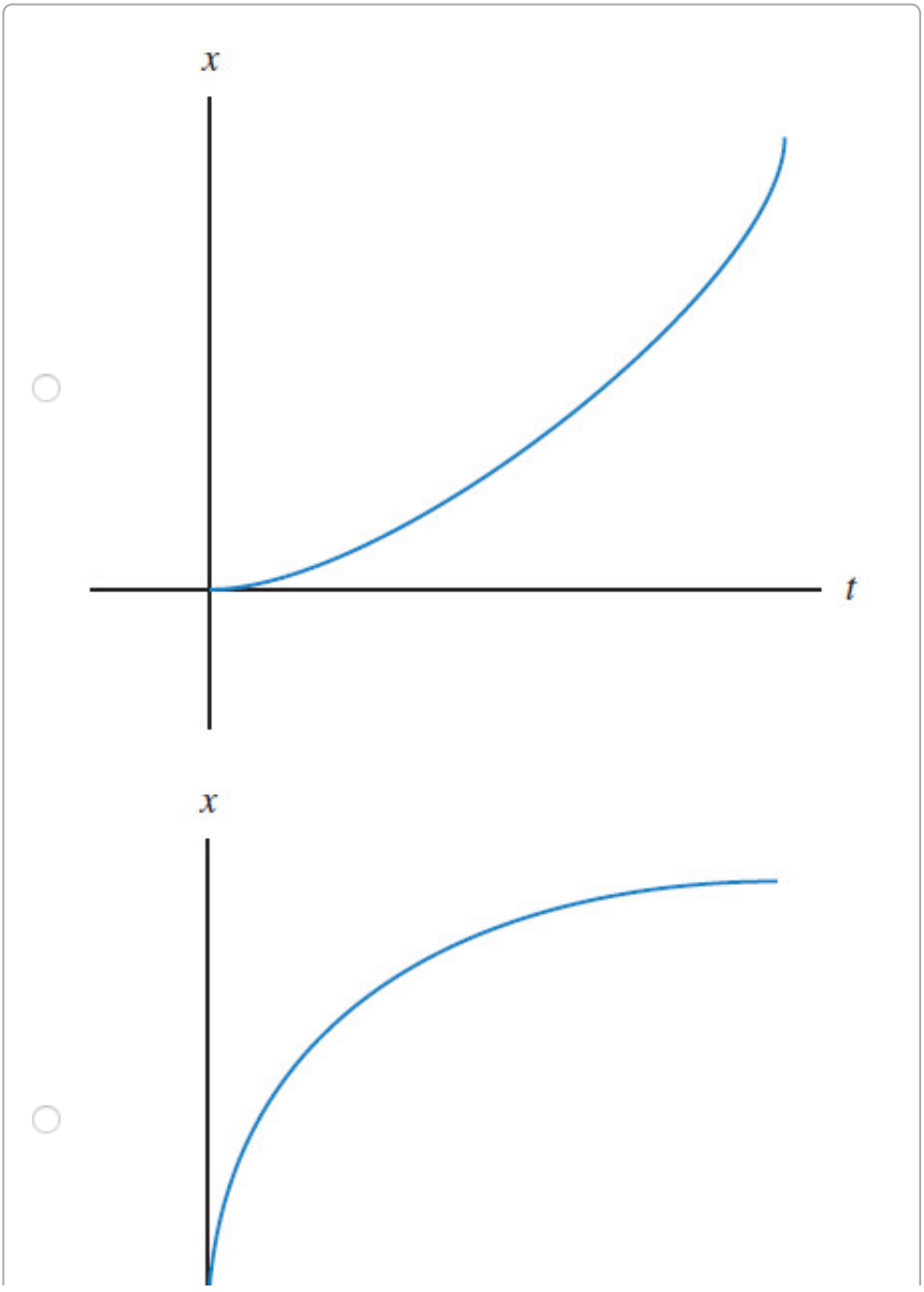
ANSWER:

θ = ____ ° below the horizontal

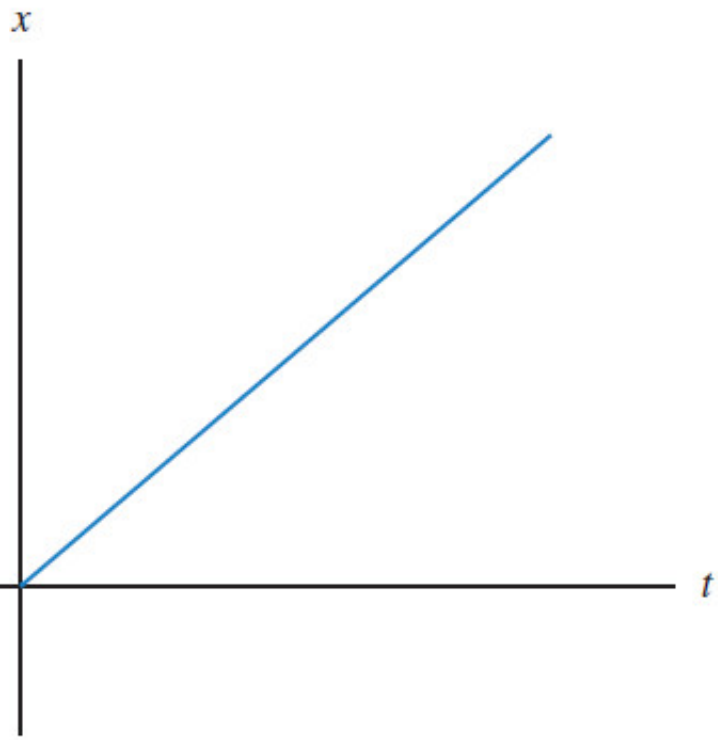
Part G

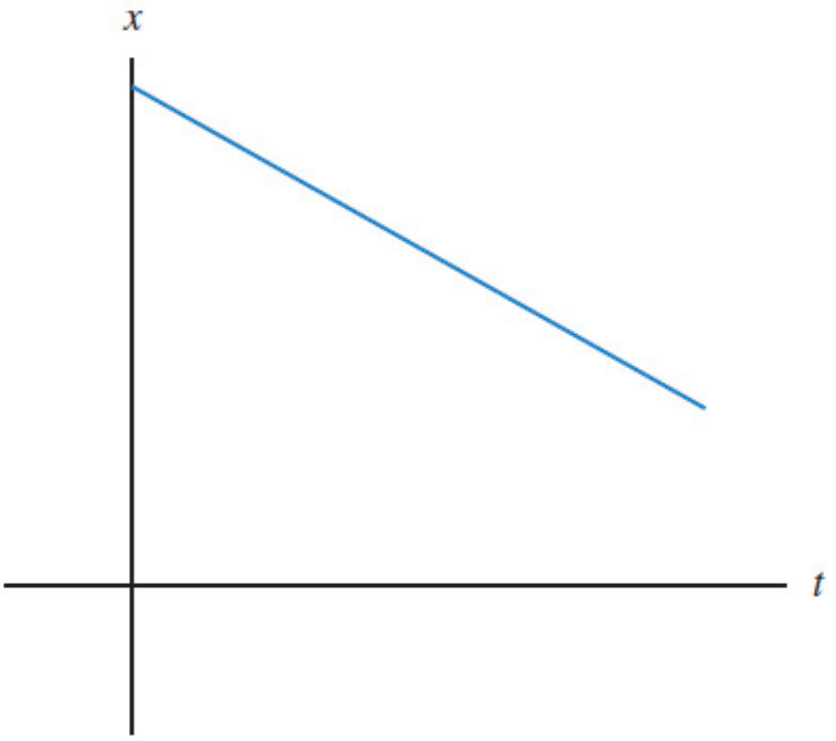
Select the correct $x - t$ graph for the motion.

ANSWER:




t

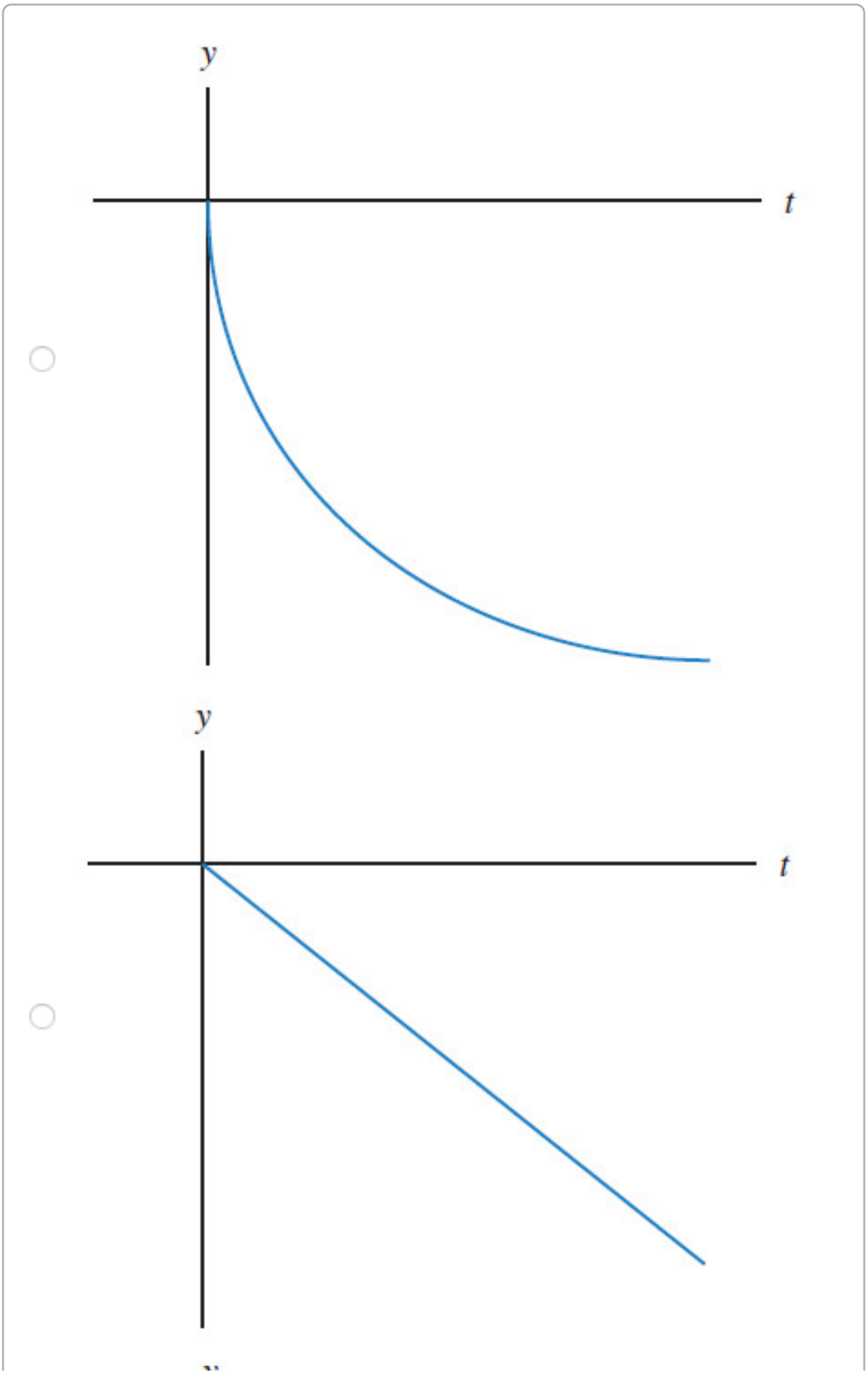

x
t

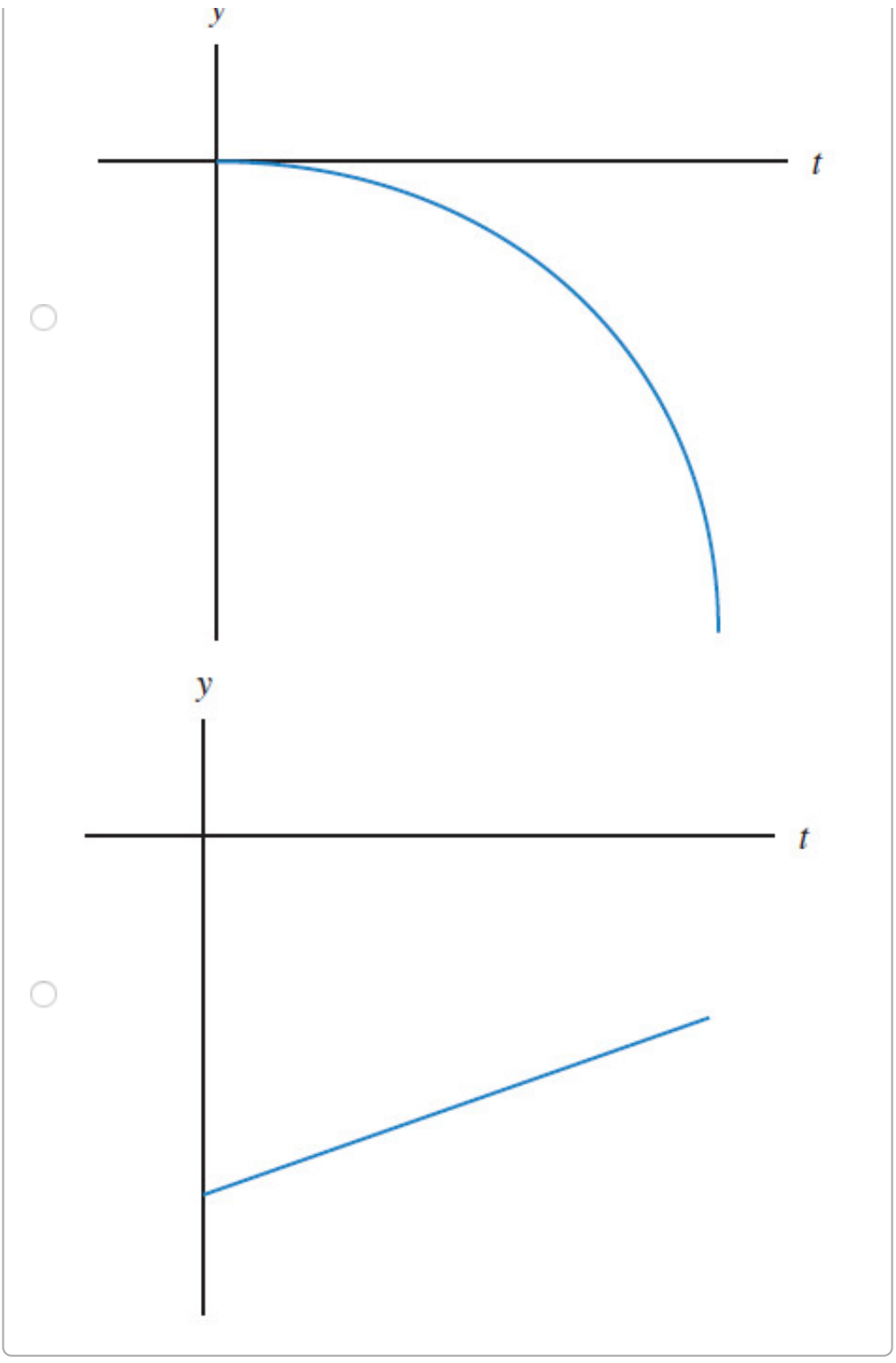

x
t

Part H

Select the correct $y - t$ graph for the motion.

ANSWER:

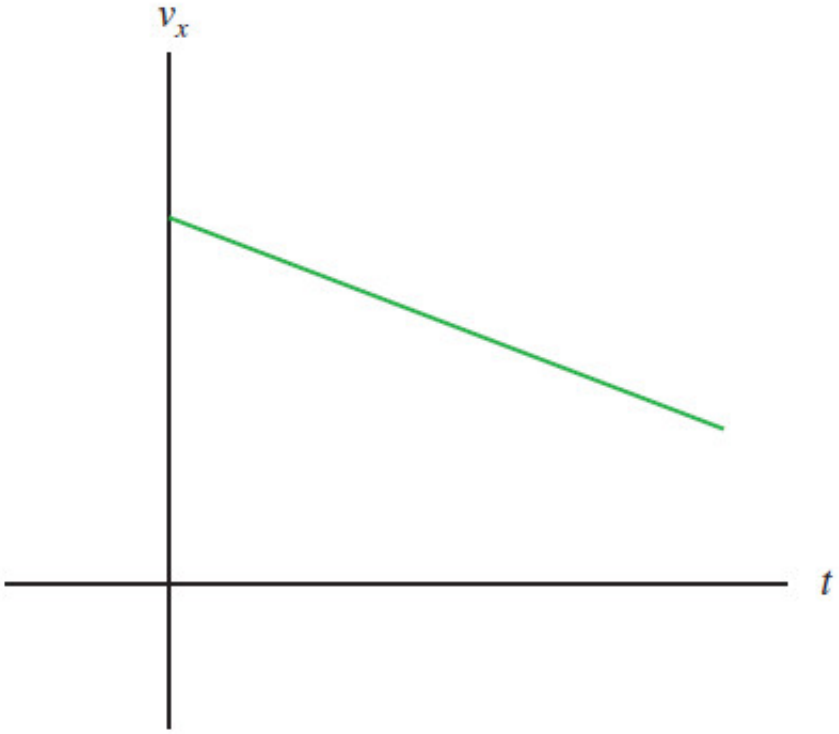


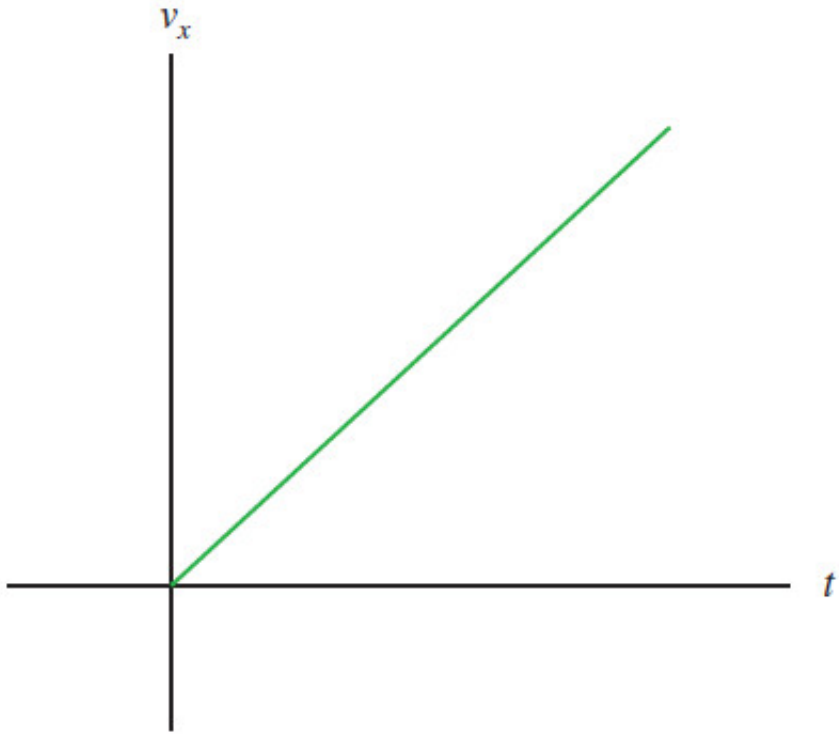


Part I

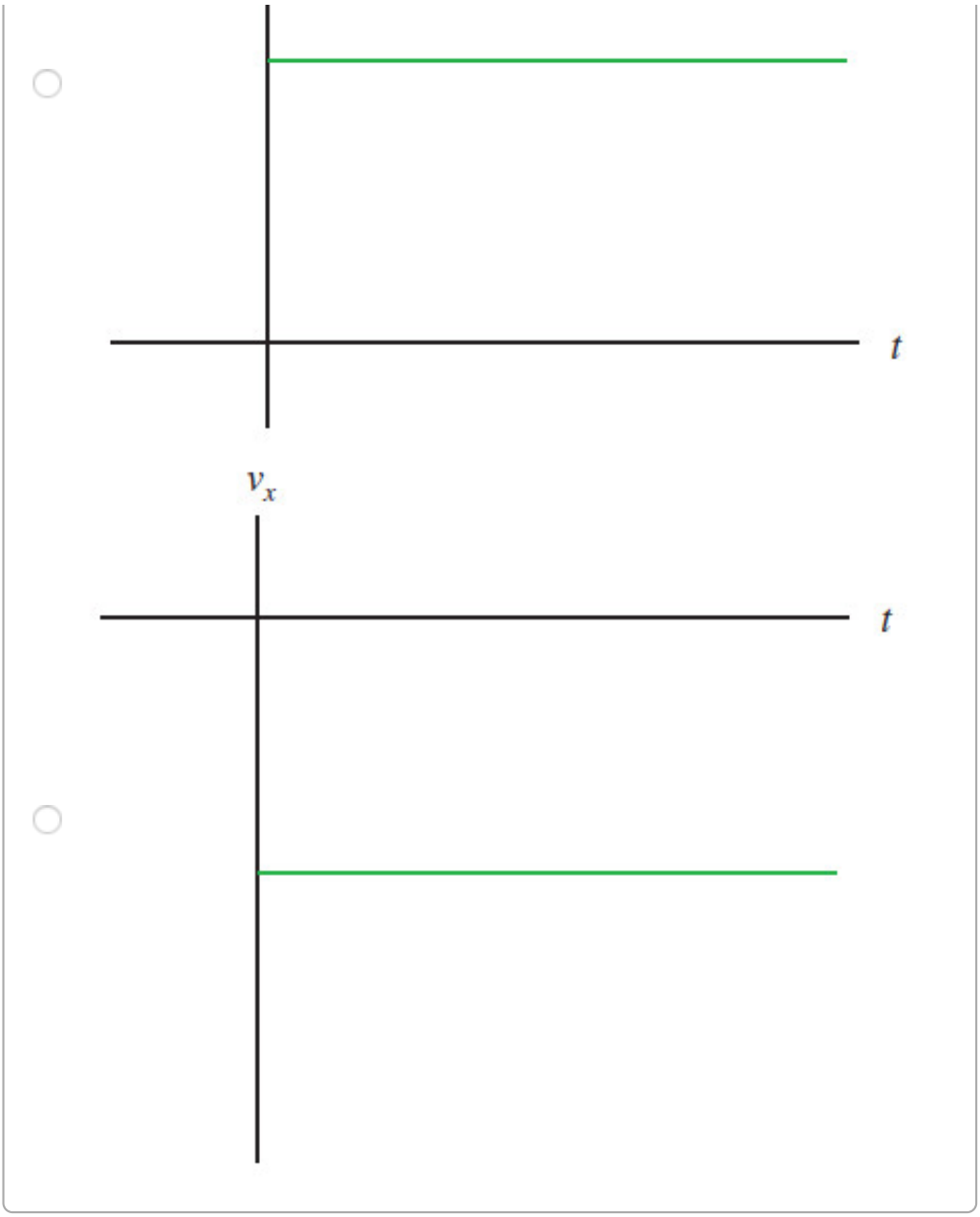
Select the correct $v_x - t$ graph for the motion.

ANSWER:


v_x
t


v_x
t

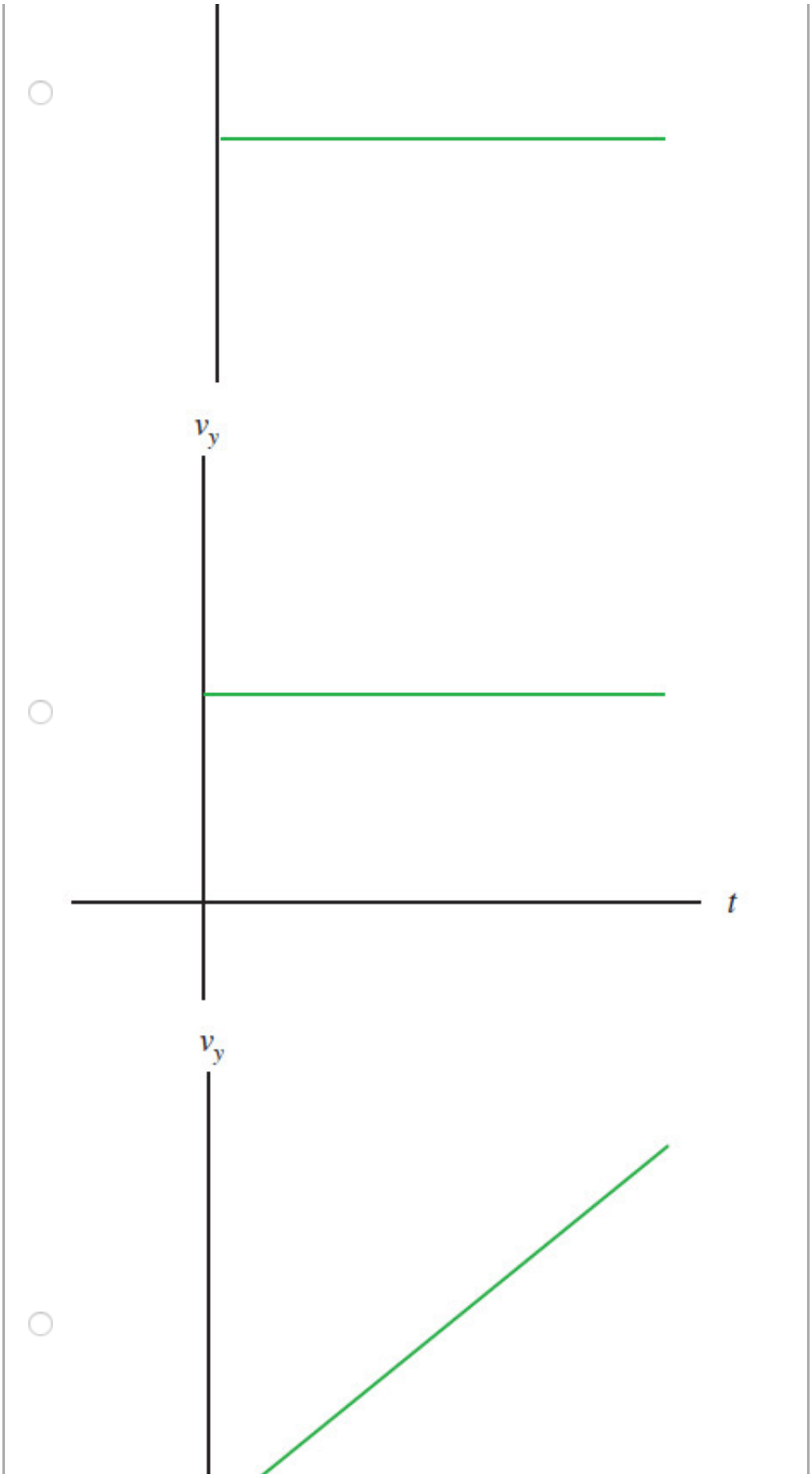

v_x

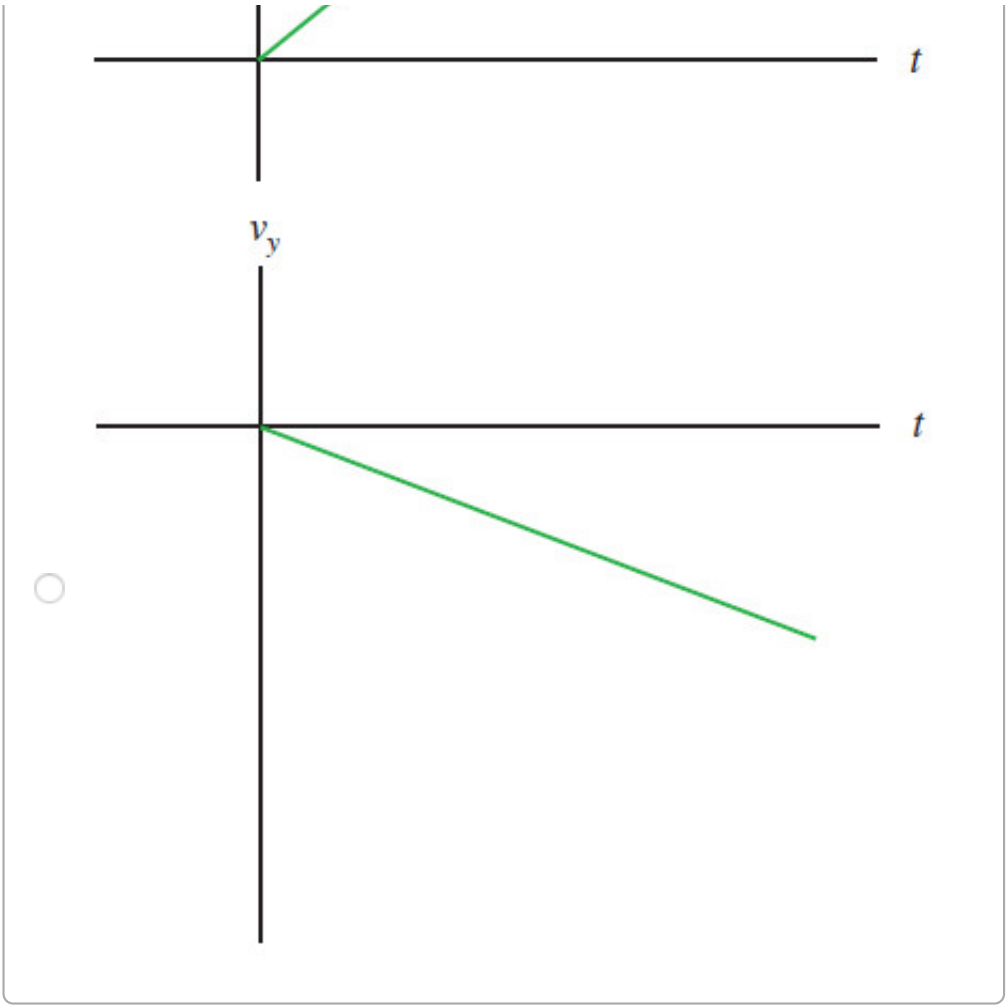


Part J

Select the correct $v_y - t$ graph for the motion.

ANSWER:


v_y
t
v_y



Exercise 3.11

Crickets Chirpy and Milada jump from the top of a vertical cliff. Chirpy just drops and reaches the ground in 3.70 s , while Milada jumps horizontally with an initial speed of 95.0 $\mathrm{cm/s}$.

Part A

How far from the base of the cliff will Milada hit the ground? Ignore air resistance.

Express your answer with the appropriate units.

ANSWER:

d =

Exercise 3.13

During a storm, a car traveling on a level horizontal road comes upon a bridge that has washed out. The driver must get to the other side, so he decides to try leaping the river with his car. The side of the road the car is on is 18.8 m above the river, while the opposite side is only 2.4 m above the river. The river itself is a raging torrent 55.0 m wide.

Part A

How fast should the car be traveling at the time it leaves the road in order just to clear the river and land safely on the opposite side?

Express your answer with the appropriate units.

ANSWER:

v_0 =

Part B

What is the speed of the car just before it lands on the other side?

Express your answer with the appropriate units.

ANSWER:

v =

Exercise 3.17

A major leaguer hits a baseball so that it leaves the bat at a speed of 32.5 $\mathrm{m/s}$ and at an angle of 36.4 $^\circ$ above the horizontal. You can ignore air resistance.

Part A

At what *two* times is the baseball at a height of 10.2 m above the point at which it left the bat?

Give your answers in ascending order separated with comma.

ANSWER:

t_1, t_2 = s

Part B

Calculate the horizontal component of the baseball's velocity at an earlier time calculated in part (a).

ANSWER:

v_x = ____ $\mathrm{m/s}$

Part C

Calculate the vertical component of the baseball's velocity at an earlier time calculated in part (a).

ANSWER:

v_y = ____ $\mathrm{m/s}$

Part D

Calculate the horizontal component of the baseball's velocity at a later time calculated in part (a).

ANSWER:

v_x = ____ $\mathrm{m/s}$

Part E

Calculate the vertical component of the baseball's velocity at a later time calculated in part (a).

ANSWER:

v_y = ____ $\mathrm{m/s}$

Part F

What is the magnitude of the baseball's velocity when it returns to the level at which it left the bat?

ANSWER:

v = ____ $\mathrm{m/s}$

Part G

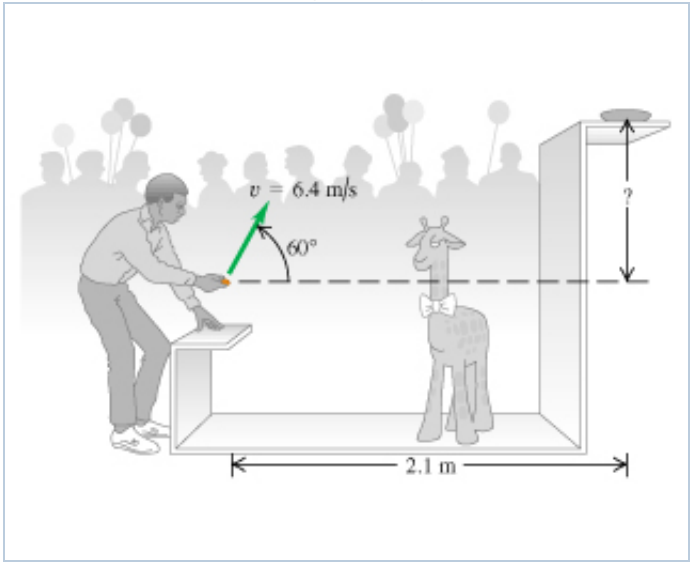
What is the direction of the baseball's velocity when it returns to the level at which it left the bat?

ANSWER:

θ = ° below the horizontal

Exercise 3.19

In a carnival booth, you win a stuffed giraffe if you toss a quarter into a small dish. The dish is on a shelf above the point where the quarter leaves your hand and is a horizontal distance of 2.1 m from this point (the figure). If you toss the coin with a velocity of 6.4 $\mathrm{m/s}$ at an angle of 60 ° above the horizontal, the coin lands in the dish. You can ignore air resistance.



Part A

What is the height of the shelf above the point where the quarter leaves your hand?

Express your answer using two significant figures.

ANSWER:

H = m

Part B

What is the vertical component of the velocity of the quarter just before it lands in the dish?

Express your answer using two significant figures.

ANSWER:

v_y = $\mathrm{m/s}$

Exercise 3.21

A man stands on the roof of a building of height 15.6 m and throws a rock with a velocity of magnitude 26.0 $\mathrm{m/s}$ at an angle of 27.8 $^\circ$ above the horizontal. You can ignore air resistance.

Part A

Calculate the maximum height above the roof reached by the rock.

ANSWER:

y = _____ m

Part B

Calculate the magnitude of the velocity of the rock just before it strikes the ground.

ANSWER:

v = _____ $\mathrm{m/s}$

Part C

Calculate the horizontal distance from the base of the building to the point where the rock strikes the ground.

ANSWER:

x = _____ m

Problem 3.41

Part A

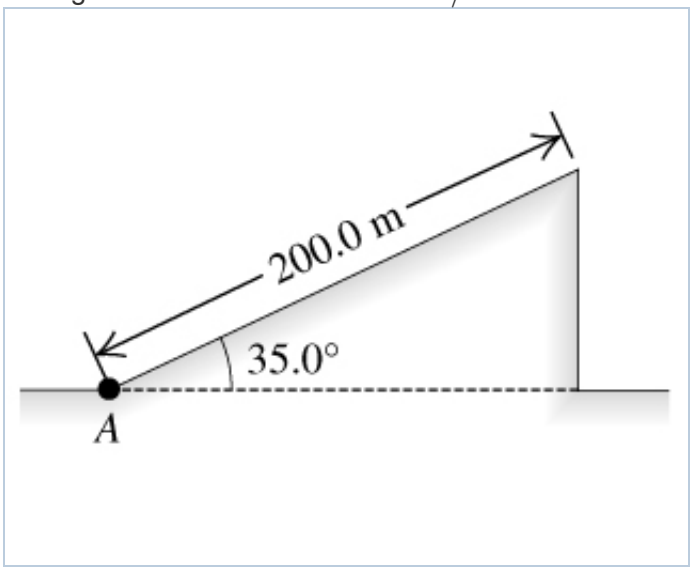
If $\vec{r} = bt^2\,\hat{i} + ct^3\,\hat{j}$, where b and c are positive constants, when does the velocity vector make an angle of 45.0° with the *x*- and *y*-axes?

ANSWER:

t = _____

Problem 3.43

A test rocket starting from rest at point *A* is launched by accelerating it along a 200.0-m incline at 2.20 $\mathrm{m/s^2}$. The incline rises at 35.0° above the horizontal, and at the instant the rocket leaves it, its engines turn off and the rocket is subject to gravity only (ignore air resistance).



Part A

Find the maximum height above the ground that the rocket reaches.

Express your answer with the appropriate units.

ANSWER:

h_{max} =

Part B

Find the rocket's greatest horizontal range beyond point *A*.

Express your answer with the appropriate units.

ANSWER:

L =

Problem 3.45

A jungle veterinarian with a blow-gun loaded with a tranquilizer dart and a sly 1.5-kg monkey are each a height 25 m above the ground in trees a distance 70 m apart. Just as the hunter shoots horizontally at the monkey, the monkey drops from the tree in a vain attempt to escape being hit.

Part A

What must the minimum muzzle velocity of the dart have been for the hunter to hit the monkey before it reached the ground?

Express your answer using two significant figures.

ANSWER:

v = _____ $\mathrm{m/s}$

Problem 3.47

In fighting forest fires, airplanes work in support of ground crews by dropping water on the fires. A pilot is practicing by dropping a canister of red dye, hoping to hit a target on the ground below.

Part A

If the plane is flying in a horizontal path at an altitude of 98.0 m above the ground and with a speed of 61.0 $\mathrm{m/s}$, at what horizontal distance from the target should the pilot release the canister? Ignore air resistance.

Take free fall acceleration to be g.

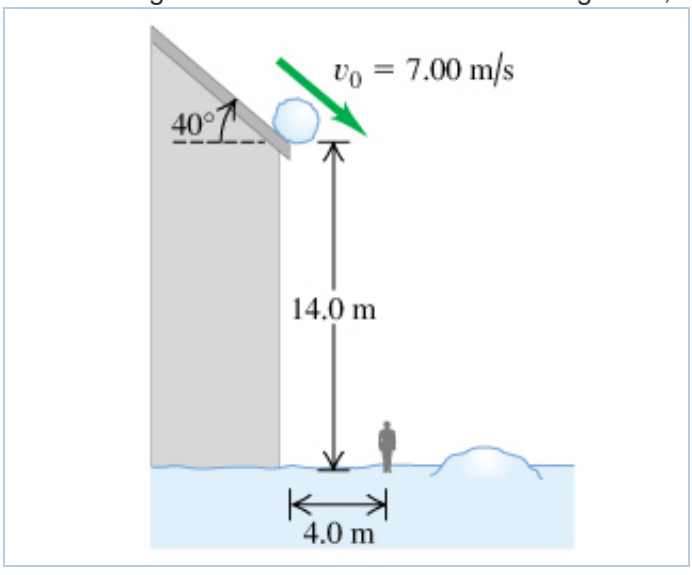
ANSWER:

x = _____ m

Problem 3.59

A snowball rolls off a barn roof that slopes downward at an angle of 40 $^\circ$. The edge of the roof is 14.0 m above the ground, and the snowball has a speed of 7.00 $\mathrm{m/s}$ as it rolls off the roof. Ignore air resistance.

Assume the coordinate origin is at the point on the roof where the snowball rolls off and that the positive *x* direction is to the right and the positive *y* direction is upwards.



Part A

How far from the edge of the barn does the snowball strike the ground if it doesn't strike anything else while falling?

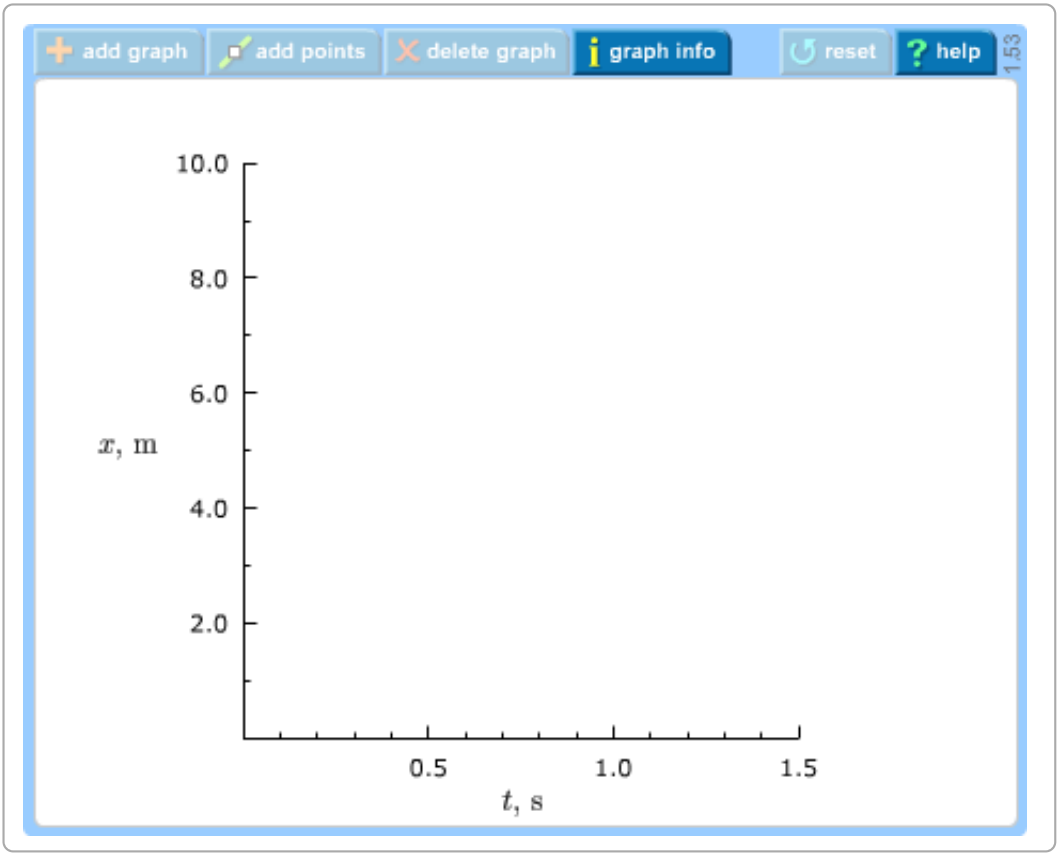
ANSWER:

x = _____ m

Part B

Draw $x - t$ graphs for the motion in part A.

ANSWER:

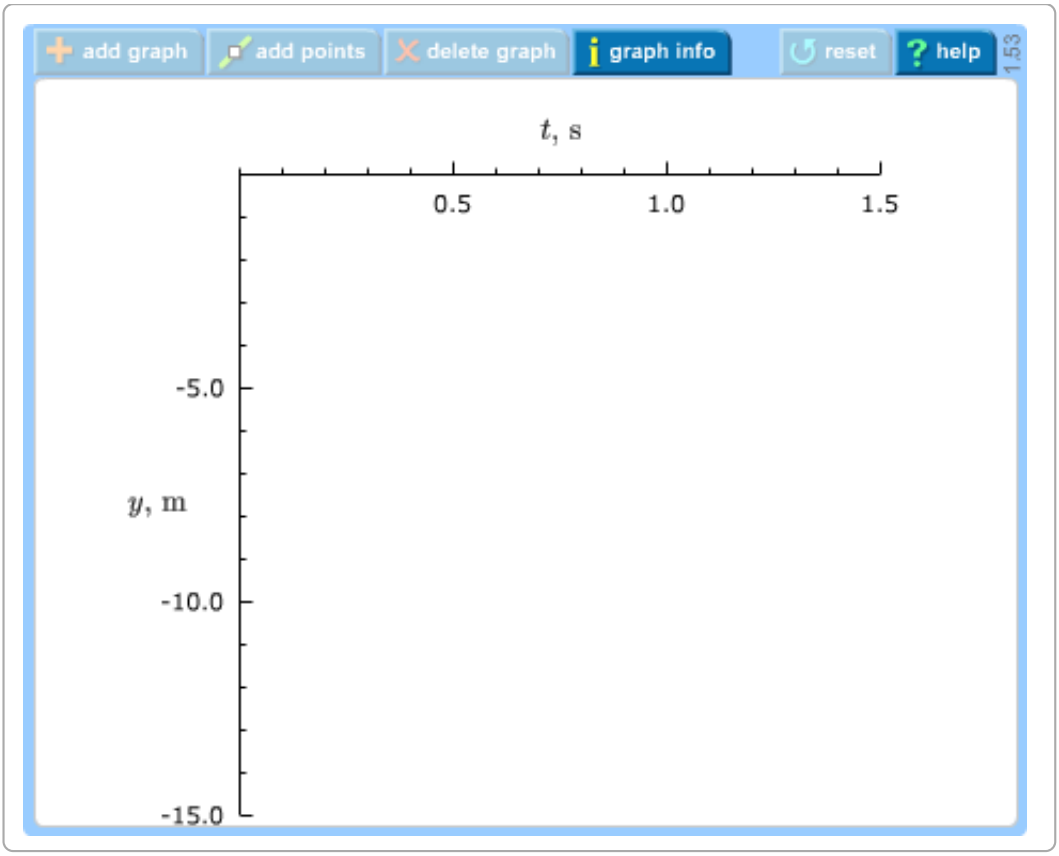


Part C

Draw $y - t$ graphs for the motion in part A.

Plot points at $t = 0\ \text{s}, t = 0.4\ \text{s}, t = 0.8\ \text{s}, t = 1.0\ \text{s}, t = 1.3\ \text{s}.$

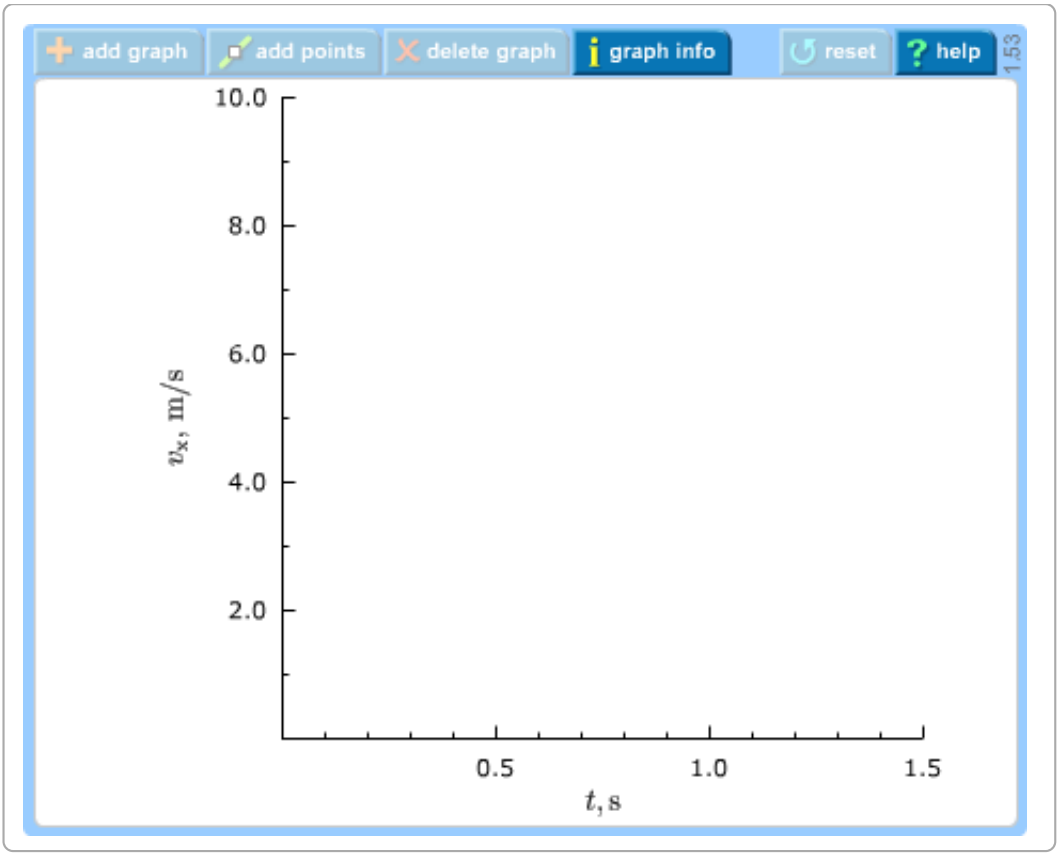
ANSWER:



Part D

Draw $v_x - t$ graphs for the motion in part A.

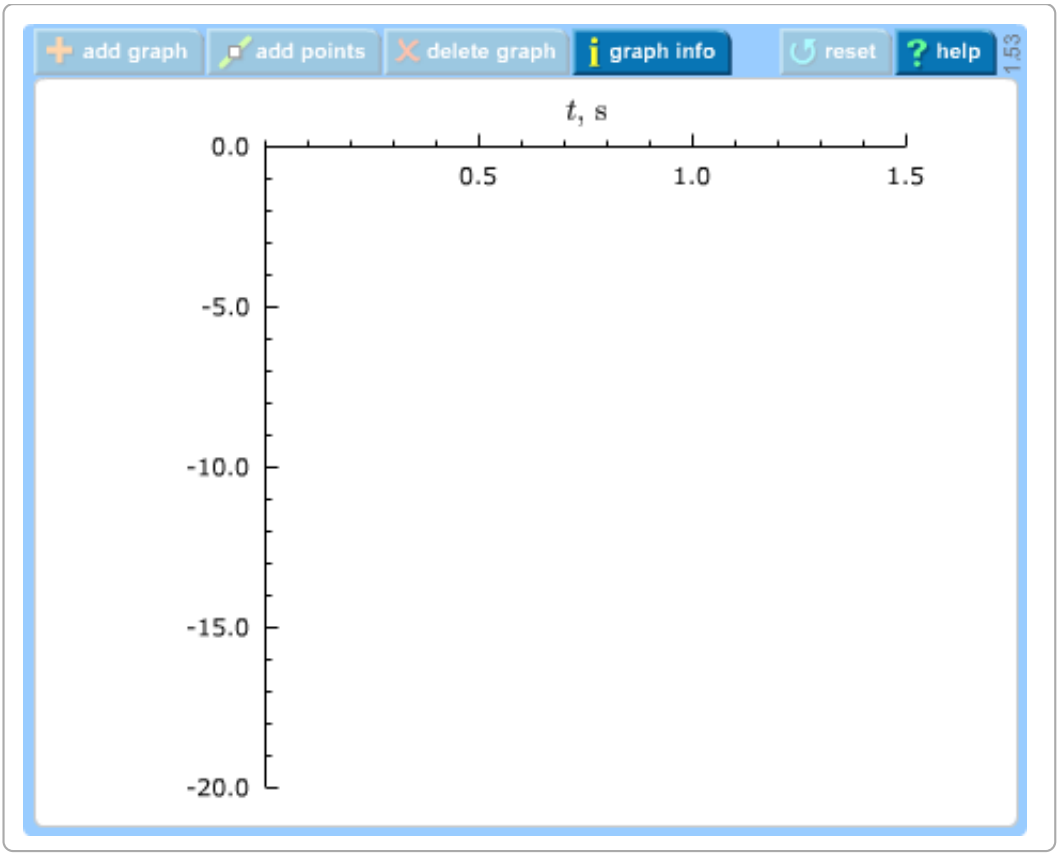
ANSWER:



Part E

Draw $v_y - t$ graphs for the motion in part A.

ANSWER:



Part F

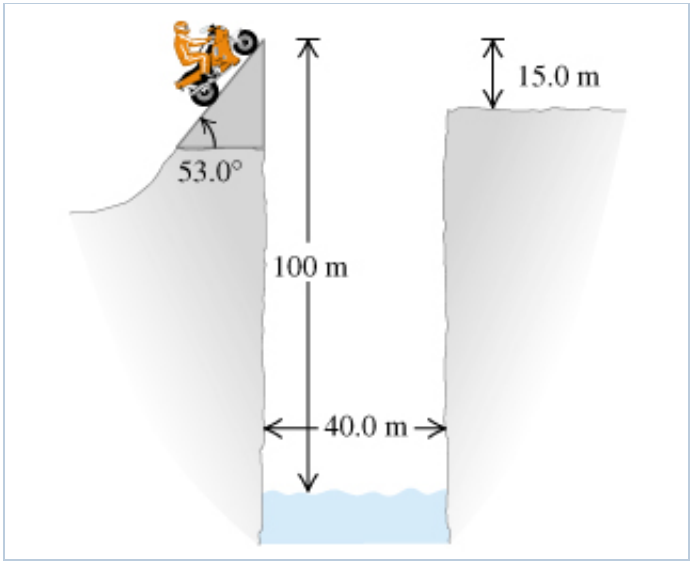
A man 1.9 m tall is standing 4.0 m from the edge of the barn. Will he be hit by the snowball?

ANSWER:

- Yes
- No

Problem 3.63

A physics professor did daredevil stunts in his spare time. His last stunt was an attempt to jump across a river on a motorcycle (the figure). The takeoff ramp was inclined at 53.0 $^\circ$, the river was 40.0 m wide, and the far bank was 15.0 m lower than the top of the ramp. The river itself was 100 m below the ramp. You can ignore air resistance.



Part A

What should his speed have been at the top of the ramp to have just made it to the edge of the far bank?

ANSWER:

v = _____ m/s

Part B

If his speed was only half the value found in part A, at what horizontal distance from the left bank did he land?

ANSWER:

L = _____ m

Score Summary:

Your score on this assignment is 0.0%.
You received 0 out of a possible total of 125 points.