WebAssign

Assignment #2: Chapter 2.1 (Homework)

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Math124A15, section F, Fall 2015
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Current Score : – / 45 **Due :** Thursday, October 8 2015 11:59 PM PDT

1. –/10 pointsSCalcET7 2.1.007.

The table shows the position of a cyclist.

t (seconds)	0	1	2	3	4	5
s (meters)	0	1.3	5.3	10.7	17.2	24.4

(a) Find the average velocity for each time period.

(i) [1, 3]
_____ m/s

(ii) [2, 3]
_____ m/s

(iii) [3, 5]
_____ m/s

(iv) [3, 4]
_____ m/s

(b) Estimate the instantaneous velocity when $t = 3$.
_____ m/s

2. –/10 pointsSCalcET7 2.1.003.

The point $P(3, -2)$ lies on the curve $y = 2/(2 - x)$.

(a) If Q is the point $(x, 2/(2 - x))$, use your calculator to find the slope m_{PQ} of the secant line PQ (correct to six decimal places) for the following values of x.

(i) 2.9
$m_{PQ} =$ [ ]

(ii) 2.99
$m_{PQ} =$ [ ]

(iii) 2.999
$m_{PQ} =$ [ ]

(iv) 2.9999
$m_{PQ} =$ [ ]

(v) 3.1
$m_{PQ} =$ [ ]

(vi) 3.01
$m_{PQ} =$ [ ]

(vii) 3.001
$m_{PQ} =$ [ ]

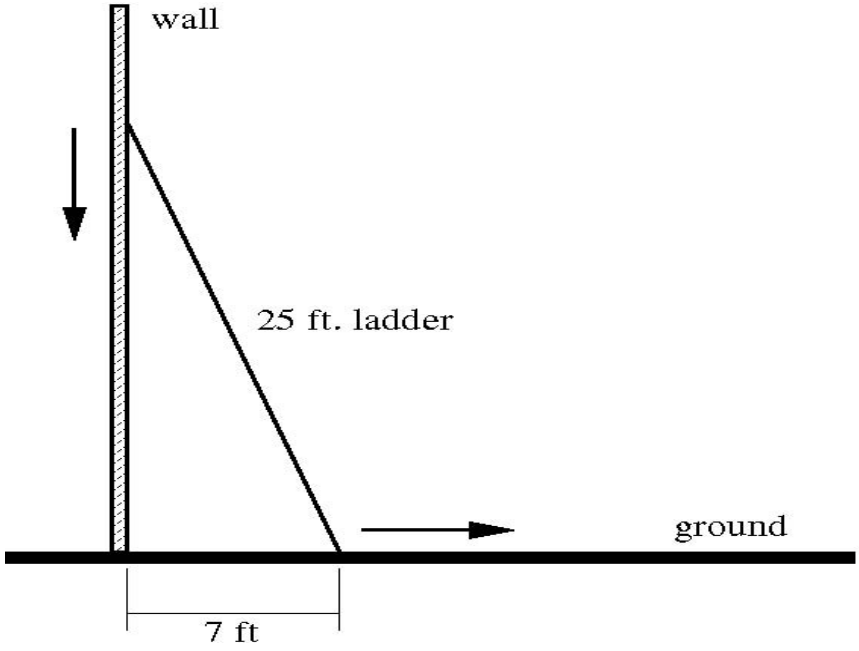
(viii) 3.0001
$m_{PQ} =$ [ ]

(b) Using the results of part (a), guess the value of the slope m of the tangent line to the curve at $P(3, -2)$.
$m =$ [ ]

(c) Using the slope from part (b), find an equation of the tangent line to the curve at $P(3, -2)$.

3. –/14 points

A ladder 25 feet long is leaning against the wall of a building. Initially, the foot of the ladder is 7 feet from the wall. The foot of the ladder begins to slide at a rate of 2 ft/sec, causing the top of the ladder to slide down the wall. The location of the foot of the ladder at time *t* seconds is given by the parametric equations *(7+2t,0)*.



(a) The location of the top of the ladder will be given by parametric equations *(0,y(t))*. The formula for *y(t)*=

. (Put your cursor in the box, click and a palette will come up to help you enter your symbolic answer.)

(b) The domain of *t* values for *y(t)* ranges from [ ] to [ ]

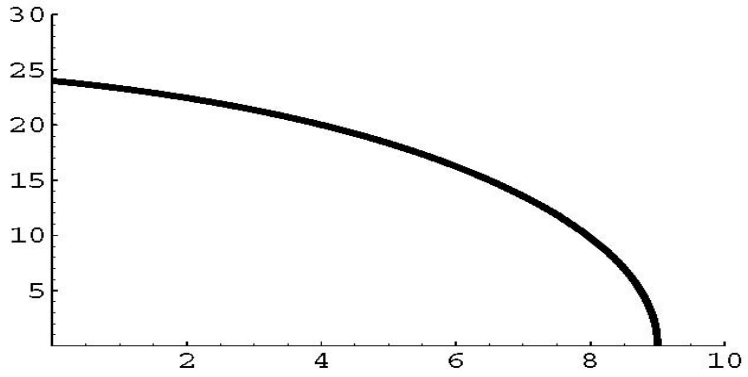
(c) Calculate the average velocity of the top of the ladder on each of these time intervals (correct to three decimal places):

time interval	ave velocity	time interval	ave velocity
[0,2]	[ ]	[2,4]	[ ]
[6,8]	[ ]	[8,9]	[ ]

(d) Find a time interval [a,9] so that the average velocity of the top of the ladder on this time interval is -20 ft/sec i.e. a= [ ]

(e) Using your work above and this picture of the graph of the function *y(t)* given below,

answer these true/false questions: (Type in the word "True" or "False")



The top of the ladder is moving down the wall at a constant rate

- T
- F

The foot of the ladder is moving along the ground at a constant rate

- T
- F

There is a time at which the average velocity of the top of the ladder on the time interval [a,9] is 1 ft/sec

- T
- F

There is a time at which the average velocity of the top of the ladder on the time interval [a,9] is 0 ft/sec

- T
- F

There is a time at which the average velocity of the top of the ladder on the time interval [a,9] is -100 ft/sec

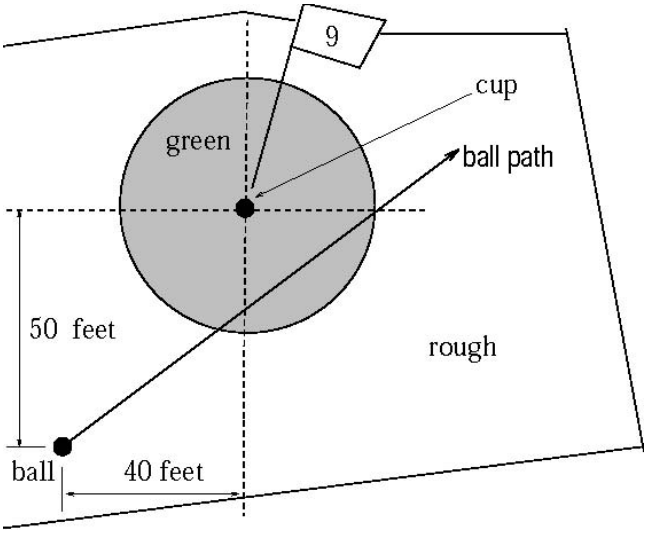
- T
- F

There is a time at which the average velocity of the top of the ladder on the time interval [a,9] is less than -100 ft/sec

- T
- F

4. –/4 points

The cup on the 9th hole of a golf course is located dead center in the middle of a circular green which is 40 feet in radius. Your ball is located as in the picture below. The ball follows a straight line path and exits the green at the right-most edge. Assume the ball travels 8 ft/sec. Introduce coordinates so that the cup is the origin of an *xy*-coordinate system. Provide numerical answers below with two decimal places of accuracy.



(a) The *x*-coordinate of the position where the ball enters the green will be ☐ .

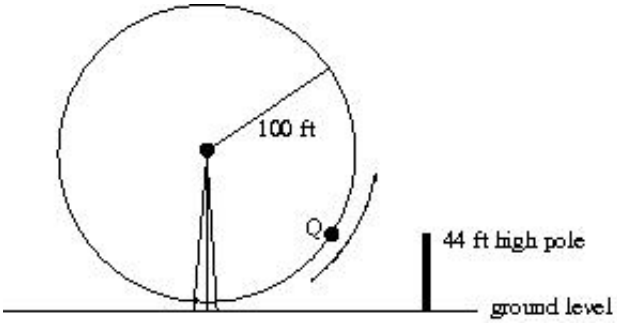
(b) The ball will exit the green exactly ☐ seconds after it is hit.

(c) Suppose that *L* is a line tangent to the boundary of the golf green and parallel to the path of the ball. Let *Q* be the point where the line is tangent to the circle. Notice that there are two possible positions for *Q*. Find the possible *x*-coordinates of Q:

smallest *x*-coordinate = ☐
largest *x*-coordinate = ☐

5. –/4 points

A Ferris wheel of radius 100 feet is rotating at a constant angular speed ω rad/sec counterclockwise. Using a stopwatch, the rider finds it takes 4 seconds to go from the lowest point on the ride to a point Q, which is level with the top of a 44 ft pole. Assume the lowest point of the ride is 3 feet above ground level.



Let $Q(t)=(x(t),y(t))$ be the coordinates of the rider at time t seconds; i.e., the parametric equations. Assuming the rider begins at the lowest point on the wheel, then the parametric equations will have the form: $x(t)=r\cos(\omega t-\pi/2)$ and $y(t)=r\sin(\omega t-\pi/2)$, where r,ω can be determined from the information given. Provide answers below accurate to 3 decimal places. (Note: We have imposed a coordinate system so that the center of the ferris wheel is the origin. There are other ways to impose coordinates, leading to different parametric equations.)

(a) r = [ ] feet

(b) ω = [ ] rad/sec

(c) During the first revolution of the wheel, find the times when the rider's height above the ground is 80 feet.

first time = [ ] sec
second time= [ ] sec

6. –/3 pointsSCalcET7 10.1.033.

Find parametric equations for the path of a particle that moves along the circle $x^2 + (y - 2)^2 = 16$ in the manner described. (Enter your answer as a comma-separated list of equations. Let x and y be in terms of t.)

(a) Once around clockwise, starting at (4, 2). $0 \le t \le 2\pi$.

(b) Three times around counterclockwise, starting at (4, 2). $0 \le t \le 6\pi$.

(c) Halfway around counterclockwise, starting at (0, 6). $0 \le t \le \pi$.