Day 7 HW KEY

Tuesday, March 3, 2015 2:45 PM

Key

6.3 Day 4 Homework
APPLICATIONS OF PARAMETRIC EQUATIONS

1. Bert is playing catch with his brother, Ernie. Bert throws the ball at a height of 6 feet with an initial velocity of 90 feet per second and at an angle of 40 degrees with the horizontal.

   a. Write the parametric equation for the position of the ball in terms of time.

$x = (90\cos 40)t$
$y = -16t^2 + (90\sin 40)t + 6$

   b. What is the maximum height the ball will reach?

(function mode... MAXIMUM)

58.29 ft

   c. At what time will the ball hit the ground? How far did Bert throw it?

$0 = -16t^2 + (90\sin 40)t + 6$
(function mode... ZERO!)
$t = 3.72$ sec

$x = (90\cos 40)(3.72)$
$x = 256.24$ ft
(quite an arm!)

   d. If Ernie is 240 feet away and can catch a ball anywhere between 1 and 7 feet above the ground, will ~~his brother~~ he catch the ball? Give a reason why or why not.

time @ 240 ft?
$240 = (90\cos 40)t$
$t = 3.48$ sec

height @ 3.48 sec?
$y = -16(3.48)^2 + (90\sin 40)(3.48) + 6$
$y = 13.5$ ft

no... it will be too far above him (6.5 ft to be exact)

2. You are standing on a 1,250 foot cliff and drop your cell phone (can you imagine anything worse?!). Write a parametric equation to model the situation and use it to determine when your phone will hit the ground and break into 1000 tiny little pieces? (Ignore air resistance)

$x = 5$ (arbitrary)
$y = -16t^2 + 1250$

time to reach a height of 0 (the ground)?
$0 = -16t^2 + 1250$
$t = 8.84$ sec

3. Mary Kate and Ashley are racing through the airport to make it on time for the flight to Paris. Mary Kate can run 8 meters per second and Ashley can run 9.2 meters per second. But SHOOT! Ashley can't find her passport so she inadvertently gives Mary Kate a 2-second head start. Who arrives at the security line first if it was 150 meters from where they started? Write a parametric equation to model the situation and use it to solve.

MK
$x = 8t$
$y = 2$

Ashley
$x = 9.2(t-1)$
$y = 5$

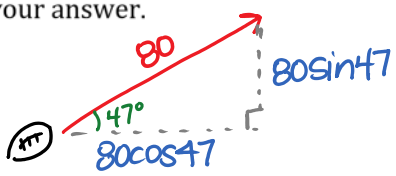
$150 = 8t$
$t = 18.75 \text{ sec}$

$150 = 9.2(t-1)$
$t = 20.30 \text{ sec}$

Mary Kate beats Ashley by 1.55 sec

*can you determine at what time Ashley would pass Mary Kate if they ran longer than 150 m?

4. The game is tied and it is up to Chicago Bears' Robbie Gould to make the field goal. He needs to make a 40 yard (120 foot) kick to clear a goal post (with a crossbar) that is 10 feet high. If he kicks the ball with an initial velocity of 80 feet per second at a 47 degree angle with the ground, will he make a field goal and clear the cross bar? Justify your answer.



$x = (80\cos 47)t$
$y = -16t^2 + (80\sin 47)t$

time to reach 120 feet?
$120 = (80\cos 47)t$
$t = 2.20 \text{ sec}$

height at 2.20 sec?
$y = 51.29 \text{ ft}$

GOOOAL! Gould clears the crossbar with 40+ feet to spare...

5. Write the parameterization of a **line** that goes through the points A(2, -3) and B(-10, 4). What would be the parameterization of the **line segment**?

one possibility (line)
$x = 2 - 12t$
$y = -3 + 7t$
$-\infty < t < \infty$

$\langle -10-2, 4+3 \rangle$
$\langle -12, 7 \rangle$

another (line segment)
$x = -10 + 12t$
$y = 4 - 7t$
$0 \le t \le 1$

$\langle 2+10, -3-4 \rangle$
$\langle 12, -7 \rangle$