

[Redacted]

Mrs. Prior
Honors Pre-Calc/Per. 2
25 November 2013

Quarter 2 Writing Assignment

To the Operators of Seven Arrows Amusement Park:

Thank you for choosing us for this assignment! We understand how vital security is important to your business. As it is necessary to add certain amounts of security at high capacity points during the day, where there are at least 5,500 people within the park, we propose extra security to protect those within the park between the hours of 11 am and 1 pm.

We used the provided data of people entering the park and the values for the number of people leaving the park per hour to construct functions to simulate those values, with the final function of the number of people currently in the park being $N(t)=3117.384t+200-800t-4$, and thus we were able to find the current number of people within the park at any given time.

First, we calculated a function for those who entered the park (see the E(t) column in **Table 2** for specific values on page 3). By roughly plotting the points for the values we had been given (see **Table 1**)

Table 1:

Time	8:00 am	2:00pm	8:00pm
Hour	0	6	12
TOTAL Number of People Who Have Entered Park	200	7836	11000

on a piece of graphing paper, we were able to discern based upon the shape that the best function family, a group of functions with the same basic type, would be a square root function. By determining that this situation would best be modeled by a square root function, we were able to use the parent function, $f(x)=x$, as the basis for creating an equation that models this particular scenario.

Since the number of people that have entered the park right at the opening (8:00 am or $t = 0$) was 200, we used this as the y-intercept on the graph, or the number of people in the park when the time is 0. Next, we needed to find an A-value so that the graph would correspond with the points provided. Therefore, we used the parent function and the y-intercept to come up with the equation, now using the variables t for time, and E for the number of people that had entered the park, $E(t)=At+200$. We were provided with the information that at 2:00 pm, or when the time is 6 hours, that 7836 people have entered (see Table 1 above). We used the time, 6 hours, as the t-value and the number of people that have entered the park by the 6th hour, 7836 people, as the E(t) value. The function had clearly been modified from its original form. The simplest possible

Amy Marie Prior 1/26/14 10:07 AM
Comment: WHY did you choose a square root function? What specifically about the graph indicated that this was a good choice?

Amy Marie Prior 1/26/14 10:07 AM
Comment: Do you mean its parent form?

way it could have been changed was its being stretched vertically. We decided to set up a new function, with a stretch factor, which we called A. After using algebra to solve for A, we were able to come to the conclusion that $A=3117.384$.

Table 3:

Function with Variable	Work
	1.
	2.
	-200 -200
	3.
	4.
	5.
	6.
	7.

We used this number to complete our equation, $E(t)=3117.384t+200$, which represents the total number of people who have entered the park based on the time (**Graph 1** shows this equation on a graph for reference).

Next, we calculated a function for the number of people who have left the park depending on the time (see the L(t) column in Table 1 for the specific values). We knew that this was a stepwise floor function because it had a set increase of 800 people beginning in one hour up to the next hour. The parent function for a floor function is $f(x)=x$. Then we knew that the graph would translate to the right 4 units because people did not start leaving until 4 hours after the park opened (12:00 or when $t = 4$). Again, we used A to represent a vertical stretch so that $E(t)=At-4$. Then, since every time the t-value increased by 1 the L(t) value increased by 800, we knew that 800 was the A value. Using both the horizontal shift and the A value, we were able to come up with the equation $L(t)=800[t-4]$ to represent the number of people that have left the park depending on the time since the park has been open (**Graph 2** is a graph of this equation for reference).

In order to find the total number of people in the park at any given time, we subtracted the L(t) values from the E(t) values (see the N(t) column in Table 1 for specific values). We then algebraically combined the two equations, $E(t)=3117.384t+200$ and $L(t)=800[t-4]$ so that we could find the total number of people, N(t), at any time without having to find both the E(t) values and the L(t) values. After combining the two equations we got one equation to represent N(t), which is $N(t)=3117.384t+200-800t-4$. (**Graph 3** shows a graph of this equation for reference).

By subtracting the L(t) values from the E(t) values or by using the N(t) equation, we were able to see at what times there were more than 5,500 people in the park. We noticed in **Table 2** that there were more than 5,500 people in the 3rd, 4th, and 5th hours from the time the park opened (from 11:00 am-1:00 pm). You may also check the validity of our statements by looking at these times on **Graph 3**. Should you do so, you would notice that these values are clearly above the 5,500 person line. Between these times, the population of the park exceeds the number

Amy Marie Prior 1/26/14 10:09 AM
Comment: Not sure we ever used this word.. "step," yes, "piecewise," yes, but "stepwise"...

Amy Marie Prior 1/26/14 10:10 AM
Comment: I understand why you choose this, but a linear function might be more appropriate because people probably leave THROUGHOUT the hour, not just on the hour.

Amy Marie Prior 1/26/14 10:09 AM
Comment: translation

Amy Marie Prior 1/26/14 10:13 AM
Comment: This function is correct (assuming the floor function makes sense) but ONLY for $t \geq 4$. You need to create a piecewise function with only E(t) for $0 \leq t < 4$.

that the current security force is able to handle. Therefore, between the hours of 11:00 am and 1:00 pm, more security personnel must be present to protect the safety of the people at the park and to ensure that they enjoy their time at the Seven Arrows Amusement Park.

Sincerely,
 Julia Pitney and Marissa Hollyer
CalcHelp Firm

Table 2:

t-Value			$N(t) = -$
Represents	Number of people total who have entered the park	Number of people total who have left the park	Number of people currently in the park
0	200	-----	200
1	3317.384	-----	3317.384
2	4608.647	-----	4608.647
3	5599.467	-----	5599.467
4	6434.768	800	5634.768
5	7170.683	1600	5570.683
6	7836	2400	5436
7	8447.823	3200	5247.823
8	9017.293	4000	5017.293
9	9552.152	4800	4752.152
10	10058.034	5600	4458.034
11	10539.193	6400	4139.193
12	10998.935	7200	3798.935
13	11439.888	8000	3439.888
14	11864.183	8800	3064.183
15	12274.576	9600	2674.576
16	12669.536	10400	2269.536

*Note: In all graphs, the x-axis is Number of Hours Since Opening.
In Graph 1, the y-axis is the number of people total who have entered the park.
In Graph 2, the y-axis is the number of people total who have left the park.
In Graph 3, the y-axis is the number of people currently in the park.

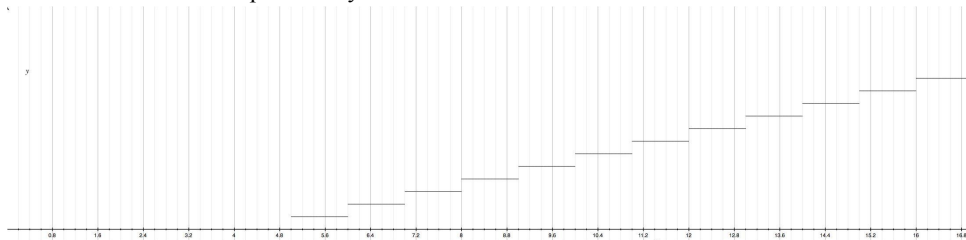
***Graph 1:**



Total Number of People At Any Time Who Have Entered the Seven Arrows Amusement Park

***Graph 2:**

Total Number of People At Any Time Who Have Left the Seven Arrows Amusement Park



***Graph 3:**

Number of People At Any Time Within the Seven Arrows Amusement Park

