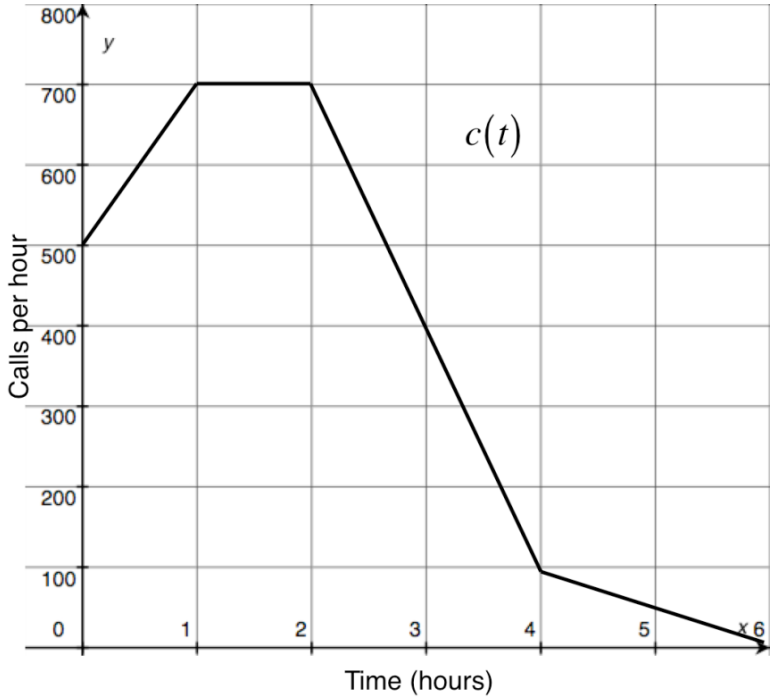
C&S Integral Case Study Test – Name: Partner:

The Broadway show, *Anything Goes*, opened a new call center for people to call in for tickets. The graph below consists of four straight lines. It shows *c(t),* the rate that new calls are coming in (calls/hour). Time, *t*, is measured in hours from when the processing starts. Assume that no one hangs up when on hold.



a. Find $\int_0^1 c(t)dt$ and explain what it means in the context of this problem.

b. Let $TC(t) = \int_0^t c(x)\,dx$ represent the total number of people who have called in to the call center since processing starts and until time, *t*. Complete the following table. Show your work to find all values for *TC(t).*

t	0	1	2	3	4	5	6
c(t)							
TC(t)							

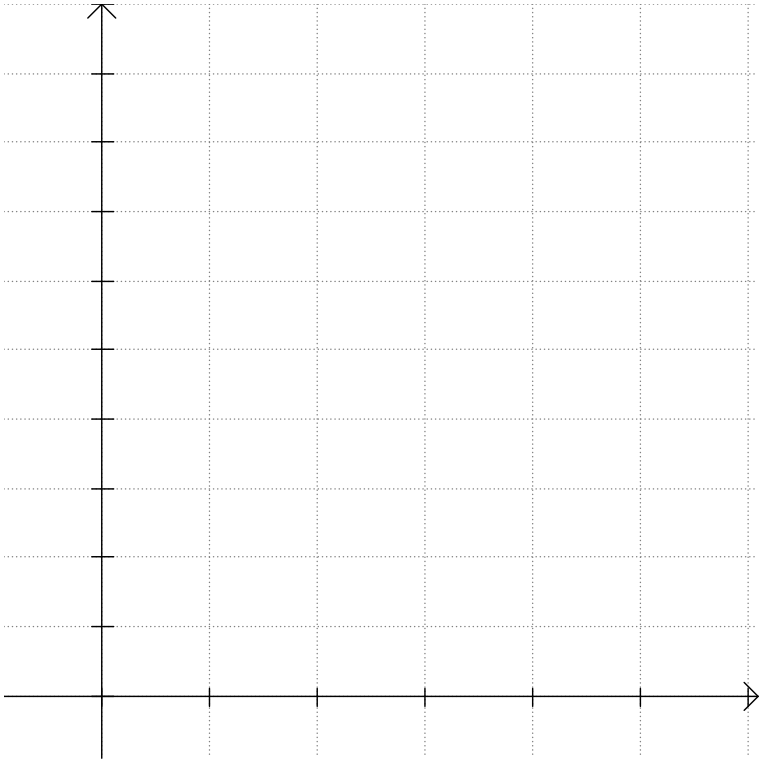
c. There are 300 people waiting on hold when the operators start processing calls. They can handle 400 calls per hour (that is, these people will no longer be on hold). To find HC(t), the number of calls on hold during hour t, we need to create

$$HC(t) = (\#Calls\ at\ Start\ of\ Day) + (\#Calls\ \text{incoming}) - (\#Calls\ processed)$$

$$HC(t) = HC(0) + \int_0^t c(x)\,dx - 400t$$

Complete the following table and graph for *HC(t).* Show your work to find all values.

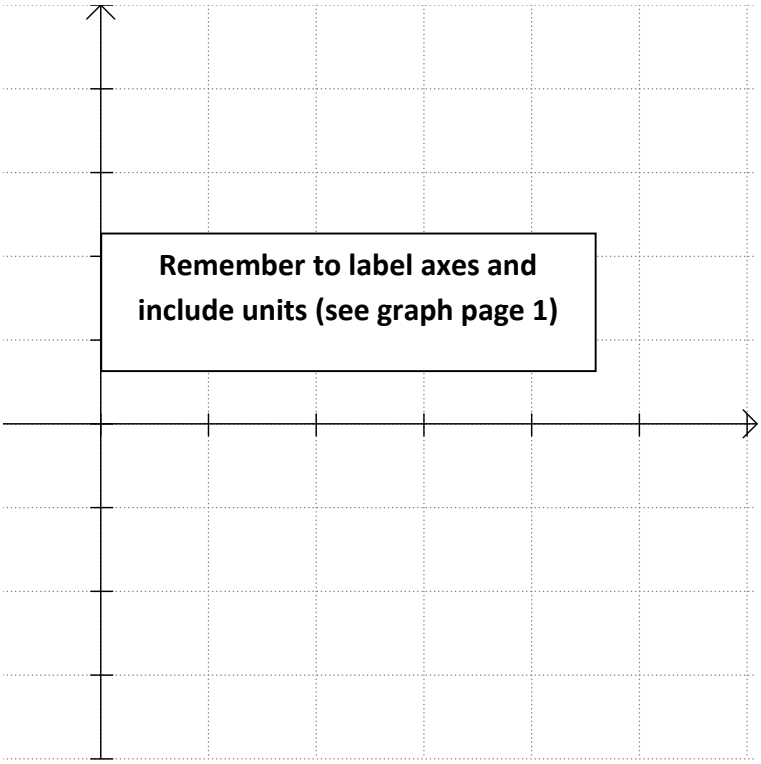
t	0	1	2	3	4	5	6
HC(t)							



Remember to label axes and include units (see graph page 1)

d. Let *nc(t)* represent the net call rate, that is, the rate that calls both come in to the center and leave the center. Since 400 calls are processed per hour, $nc(t) = c(t) - 400$ (calls/hour) Sketch a graph of *nc(t).*

t	0	1	2	3	4	5	6
c(t)	500	700	700	400	100	50	0
nc(t)							



Remember to label axes and include units (see graph page 1)

e. At what time, *t*, is the number of people on hold greatest? Use ***both*** graphs to explain your answer.