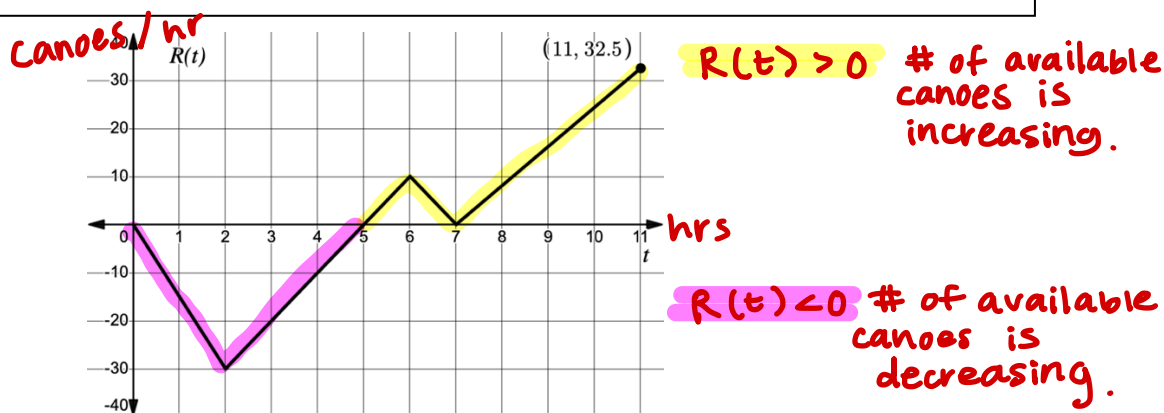




How Many Canoes Are Available?



A canoe rental livery rents out canoes to customers to use on a nearby river. The livery has 80 canoes available. The rate of change of the number of canoes available at the livery on a Saturday can be modeled by the function R for $0 \leq t \leq 11$, where $R(t)$ is measured in canoes per hour, and t is measured in hours since the livery opened. The graph of R is shown.



- What does it mean in this context if $R(t)$ is below the t -axis?
The # of canoes available is decreasing.
More canoes are being rented than returned.
- What does it mean in this context if $R(t)$ is above the t -axis?
The # of canoes available is increasing.
More canoes are being returned than are being rented out.
- The function C is defined as $C(x) = 80 + \int_0^x R(t) dt$.

a. Find $C(0)$. Interpret your answer in the context of this problem.

$C(0) = 80$ At time $t=0$, 80 canoes are available at the livery.

b. Find $C(6)$. Interpret your answer in the context of this problem.

$C(6) = 80 + \int_0^6 R(t) dt = 80 - \frac{1}{2}(5)(30) + \frac{1}{2}(1)(10) = 10$
At time $t=6$, 10 canoes are available at the livery.

4. Write an equation for $C'(x)$ and find $C'(2)$. Interpret your answer in context.

$C'(x) = 0 + R(x) = R(x)$ The # of canoes available is decreasing at a rate of 30 canoes per hour.
 $C'(2) = R(2) = -30$

5. When is the number of canoes available decreasing? How do you know?

Between $t=0$ and $t=5$ because $R(t)$ is below the t -axis so we are losing canoes. $0 < x < 5$ because $C' = R$ is negative (negative accumulation)

6. When is the number of canoes available at a minimum? Justify your answer.

At $t=5$ because the derivative of C changes from negative to positive. $C' = R$ changes from neg to pos.

7. When is the number of canoes available increasing at a decreasing rate? Justify your answer.

$6 < t < 7$ because the rate of change of canoes is positive but decreasing.

Input: Time (x)
Output: # of canoes available

$C'(x) = R(x)$

$C' = R > 0$
 $C'' = R' < 0$

