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MATH 100

Fall 2022

HW 9: Due 10/26

"There's nothing inside you. I invented you inside my head. For 12 years, I've been inventing you—I made you up."

—Sunny Balwani, The Droupout

Problem 1. (10pt) Louise just read *Remembrance of Things Past* by Marcel Proust, which is approximately 3,200 pages long. She kept careful track of the time she was at various pages. She found that she could model the amount of pages she had read, P , after t hours by $P(t) = 65t$.

- (a) Find and interpret the slope of $P(t)$.
- (b) Find and interpret the y -intercept of $P(t)$.
- (c) How long did it take her to read this work?

Solution.

- (a) Because the function $P(t) = 65t$ has the form $f(x) = mx + b$ for $m = 65$ and $b = 0$, we know that $P(t)$ is linear and that the slope is $m = 65 = \frac{65}{1}$. Interpreting the slope $m = \frac{\Delta P}{\Delta t}$, we can see that every additional hour, Louise increases the page count by 65, i.e. Louise reads 65 pages per hour.
- (b) Because the function $P(t) = 65t$ has the form $f(x) = mx + b$ for $m = 65$ and $b = 0$, we know that $P(t)$ is linear and that the y -intercept is $b = 0$. That is, at time $t = 0$, there have been zero pages read of the book. Then the y -intercept is the fact that at the start, Louise had only just begun reading the book.
- (c) She is finished reading the work when she has completed the 3,200 pages, i.e. when $P(t) = 3200$. But then we have...

$$P(t) = 3200$$

$$65t = 3200$$

$$t = 49.23$$

Therefore, Louise finishes the book after 49.23 hours, i.e. 49 hours, 13 minutes, and 50 seconds.

Problem 2. (10pt) Suppose that the number of people, N that have ridden the subway t hours after 8:00 am can be modeled by $N(t) = 8429t - 1008$.

- (a) Find and interpret the slope of $N(t)$.
- (b) Does the y -intercept of $N(t)$ have an interpretation in the context of this problem? Explain.
- (c) Find the number of people that have ridden the subway by 5 pm.

Solution.

- (a) Because $N(t) = 8429t - 1008$ has the form $f(x) = mx + b$ with $m = 8429$ and $b = -1008$, we know that $N(t)$ is linear with slope $m = 8429$. Interpreting this as $\frac{\Delta N}{\Delta t}$, we can see that for every additional hour, the number of people that have ridden the subway has increased by 8,429, i.e. 8,429 people ride the subway every hour.
- (b) Because $N(t) = 8429t - 1008$ has the form $f(x) = mx + b$ with $m = 8429$ and $b = -1008$, we know that $N(t)$ is linear with y -intercept -1008 , i.e. $(0, -1008)$. That this means at $t = 0$, i.e. 8:00 am, -1008 have ridden the subway. As this is impossible, the y -intercept does not have an interpretation in the context of the problem.
- (c) We know that 5 pm is 9 hours after 8:00 am. But then we have...

$$N(9) = 8429(9) - 1008 = 75861 - 1008 = 74853$$

Therefore, 74,853 people have ridden the subway by 5 pm.