SECTION 5.4: THE NET CHANGE THEOREM

1. Quick Review: Evaluate the following.

   (a) $\int \left(\dfrac{x}{3} - \sin(x) \right) \, dx$

   (b) $\int_0^5 (3 - e^x) \, dx$

   (c) $\dfrac{d}{dx} \left(\int_1^{x^2} (\ln(t)) \, dt \right)$

2. Assume $P'(t)$ gives the rate of change in a population of ants over time where time t is measured in days and $P'(t)$ is measured in hundreds of ants per day. Use the table below to answer the questions.

t	0	7	14	21	28	35
P'(t)	0	1.9	2.4	2.7	3.0	3.2

   (a) Interpret $P'(14) = 2.4$.

   (b) Estimate how much the ant population increased in the first three weeks. Include units with your answer.

   (c) What would $\int_0^{21} P'(t) \, dt$ represent? (There are many ways to answer this question. Think of as many as you can. Include units this that is appropriate)

   (d) What would $P(t)$ represent? What is $P(14)$?

3. The Net Change Theorem:

4. Snow is falling on my garden at a rate of

$$A(t) = 10e^{-2t}$$

kilograms per hour for $0 \le t \le 2$, where t is measured in hours.

(a) Find $A(1)$ and interpret in the context of the problem.

(b) If $m(t)$ is the total mass of snow on my garden, how are $m(t)$ and $A(t)$ related to each other?

(c) What does $m(2) - m(0)$ represent?

(d) Find an antiderivative of $A(t)$.

(e) Compute the total amount of snow accumulation from $t = 0$ to $t = 1$.

(f) Compute the total amount of snow accumulation from $t = 0$ to $t = 2$.

(g) From the information given so far, can you compute $m(2)$?

(h) Suppose $m(0) = 9$. Compute $m(1)$ and $m(2)$.

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