

Warm-up Problems - January 25, 2006

1. An oil company estimates that oil is pumped from one of its oil fields at a rate of

$$R(t) = \frac{50t}{t^2 + 50} + 5$$

where R is the rate of production (in thousands of barrels per year) and t is the number of years after pumping began.

(a) Find $\int_1^{10} R(t) dt$

(b) What does your answer in the previous part mean?

Lecture Problems

2. Researcher at Anheuser-Busch have determined that the length of time a case of Budweiser beer sits on a shelf is a continuous random variable with probability density function

$$f(t) = \begin{cases} \frac{200}{(x+10)^3} & \text{if } x \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

where t is in number of days. You don't need to check that f is a pdf, it is. But, notice that $f(x) \geq 0$ for all x .

- (a) Find the probability that a randomly selected case of beer sits on the shelf for between at most 10 days.
 - (b) Find the probability that a randomly selected case of beer sits on the shelf for between at least 10 days.
3. Consider an income stream with rate of flow $f(t) = 200e^{0.02t}$.
- (a) Find the total income of the stream over 10 years. Explain why your answer is reasonable.
 - (b) If the interest rate is 5%, compounded continuously, find the future value of the income stream in 10 years.