



AP[®] Calculus BC 2002 Sample Student Responses

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Work for problem 2(a)

$$\int_9^{17} E(t) dt = \int_9^{17} \frac{15600}{(t^2 - 24t + 160)} dt = 6004.27$$

≈ 6004 people

Work for problem 2(b)

$$\int_9^{23} \left(\frac{15600}{t^2 - 24t + 160} \right) dt = \text{TOTAL ENTERED}$$

= 7275.55 \approx 7276 people

$$\begin{array}{r} 7276 \\ - 6004 \\ \hline \text{AFTER 5} \rightarrow 1272 \\ \times \$11 \\ \hline \$13,992 \end{array}$$

$$\begin{array}{r} \text{BEFORE 5 } 6004 \\ \times \$15 \\ \hline \$90,060 \end{array} + = \$104,052 \text{ made on the given day}$$

Work for problem 2(c)

$$H(17) = \int_9^{17} \left(\frac{15600}{t^2 - 24t + 160} \right) - \left(\frac{9890}{t^2 - 38t + 370} \right) dt = 3725$$

$$H'(17) = \left(\frac{15600}{(17^2 - 24(17) + 160)} \right) - \left(\frac{9890}{(17^2 - 38(17) + 370)} \right)$$

$$= 380 - 760$$

$H'(17) = -380 \rightarrow$ This is the rate of change at 5 o'clock that people are entering the park compared to those leaving the park. More people leaving than entering at $t = 17$.

$H(17) = 3725 \rightarrow$ This is the amount of people instantaneously at the park.

Work for problem 2(d)

$$H'(t) = \frac{15600}{(t^2 - 24t + 160)} - \frac{9890}{t^2 - 38t + 370} = 0$$

$$t = 15.7948$$

Work for problem 2(a)

$$\int_9^{17} \frac{15600}{(t^2 - 24t + 160)} dt = 6004 \text{ people}$$

Work for problem 2(b)

$$15 \int_9^{17} \frac{15600}{(t^2 - 24t + 160)} dt + 11 \int_{17}^{23} \frac{9890}{(t^2 - 38t + 370)} dt$$

$$90064 + 54950$$

$$\$ 145,014$$

Work for problem 2(c)

$$H'(t) = E(t) - L(t)$$

$$H'(17) = 380.4878 - 760.7692$$

$$H'(17) = -452.2814$$

$H(17)$ represents the number of people in the park at $t=17$. $H'(17)$ represents the rate at which the population of the park is changing at $t=17$

Work for problem 2(d)

$$E(t) - L(t) = 0$$

$$\frac{15600}{(t^2 - 20t + 160)} - \frac{9890}{t^2 - 38t + 370} = 0; t = \boxed{15.79481}$$