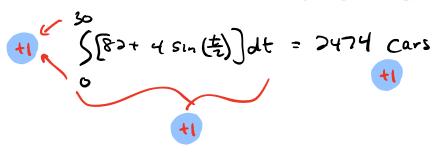
## 2004 AP® CALCULUS AB Problem #1

Traffic flow is defined as the rate at which cars pass through an intersection, measured in cars per minute. The traffic flow at a particular intersection is modeled by the function F defined by

$$F(t) = 82 + 4\sin\left(\frac{t}{2}\right)$$
 for  $0 \le t \le 30$ ,

where F(t) is measured in cars per minute and t is measured in minutes.

(a) To the nearest whole number, how many cars pass through the intersection over the 30-minute period?



(b) Is the traffic flow increasing or decreasing at t = 7? Give a reason for your answer.

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 for  $0 \le t \le 30$ ,

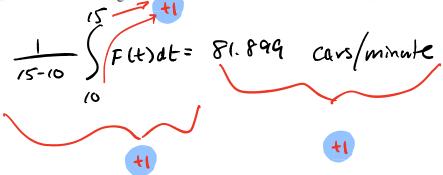
$$F'(n) = -1.873$$

$$F'(x) \angle 0 \text{ at } x = 7$$

$$\therefore \text{ traffic flow is decreasing at } x = 7$$

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(c) What is the average value of the traffic flow over the time interval  $10 \le t \le 15$ ? Indicate units of measure.



(d) What is the average rate of change of the traffic flow over the time interval 10 ≤ t ≤ 15? Indicate units of measure.

$$ARC = \frac{F(10) - F(15)}{10 - 15} = 1.518 car/mm2$$