| $t$ (sec) | 0 | 15 | 25 | 30 | 35 | 50 | 60 |
|---|---|---|---|---|---|---|---|
| $v(t)$ $(\text{ft}/\text{sec})$ | –20 | –30 | –20 | –14 | –10 | 0 | 10 |
| $a(t)$ $\left(\text{ft}/\text{sec}^2\right)$ | 1 | 5 | 2 | 1 | 2 | 4 | 2 |

6. A car travels on a straight track. During the time interval $0 \le t \le 60$ seconds, the car's velocity $v$, measured in feet per second, and acceleration $a$, measured in feet per second per second, are continuous functions. The table above shows selected values of these functions.

   (a) Using appropriate units, explain the meaning of $\int_{30}^{60} |v(t)|\, dt$ in terms of the car's motion. Approximate $\int_{30}^{60} |v(t)|\, dt$ using a trapezoidal approximation with the three subintervals determined by the table.

   (b) Using appropriate units, explain the meaning of $\int_{0}^{30} a(t)\, dt$ in terms of the car's motion. Find the exact value of $\int_{0}^{30} a(t)\, dt$.

   (c) For $0 < t < 60$, must there be a time $t$ when $v(t) = -5$ ? Justify your answer.

   (d) For $0 < t < 60$, must there be a time $t$ when $a(t) = 0$ ? Justify your answer.

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**WRITE ALL WORK IN THE EXAM BOOKLET.**

**END OF EXAM**

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