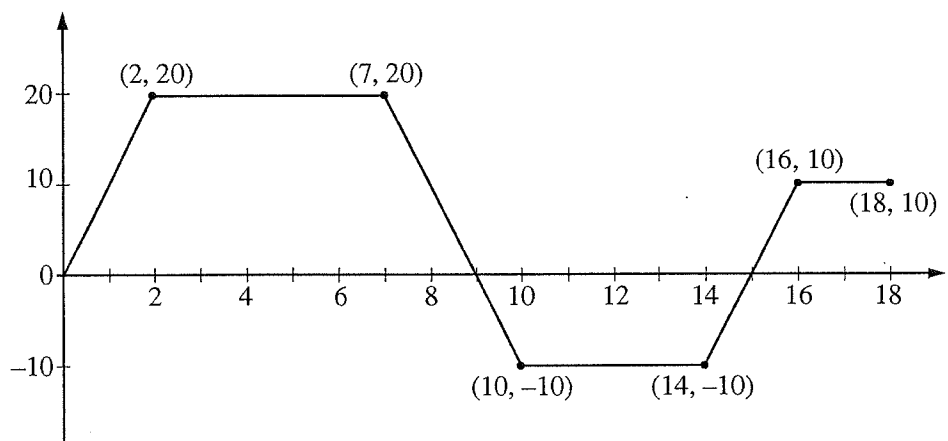


No calculator is allowed for these problems.



4. A squirrel starts at building  $A$  at time  $t = 0$  and travels along a straight, horizontal wire connected to building  $B$ . For  $0 \leq t \leq 18$ , the squirrel's velocity is modeled by the piecewise-linear function defined by the graph above.
- At what times in the interval  $0 < t < 18$ , if any, does the squirrel change direction? Give a reason for your answer.
  - At what time in the interval  $0 \leq t \leq 18$  is the squirrel farthest from building  $A$ ? How far from building  $A$  is the squirrel at that time?
  - Find the total distance the squirrel travels during the time interval  $0 \leq t \leq 18$ .
  - Write expressions for the squirrel's acceleration  $a(t)$ , velocity  $v(t)$ , and distance  $x(t)$  from building  $A$  that are valid for the time interval  $7 < t < 10$ .
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$x$	2	3	5	8	13
$f(x)$	1	4	-2	3	6

5. Let  $f$  be a function that is twice differentiable for all real numbers. The table above gives values of  $f$  for selected points in the closed interval  $2 \leq x \leq 13$ .
- Estimate  $f'(4)$ . Show the work that leads to your answer.
  - Evaluate  $\int_2^{13} (3 - 5f'(x)) dx$ . Show the work that leads to your answer.
  - Use a left Riemann sum with subintervals indicated by the data in the table to approximate  $\int_2^{13} f(x) dx$ . Show the work that leads to your answer.
  - Suppose  $f'(5) = 3$  and  $f''(x) < 0$  for all  $x$  in the closed interval  $5 \leq x \leq 8$ . Use the line tangent to the graph of  $f$  at  $x = 5$  to show that  $f(7) \leq 4$ . Use the secant line for the graph of  $f$  on  $5 \leq x \leq 8$  to show that  $f(7) \geq \frac{4}{3}$ .
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