CALCULUS AB
SECTION II, Part B
Time—45 minutes
Number of problems—3

No calculator is allowed for these problems.

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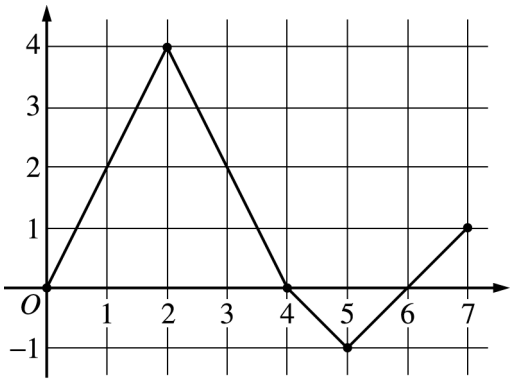
4. A particle moves along the x-axis with velocity at time $t \geq 0$ given by $v(t) = -1 + e^{1-t}$.

   (a) Find the acceleration of the particle at time $t = 3$.

   (b) Is the speed of the particle increasing at time $t = 3$? Give a reason for your answer.

   (c) Find all values of t at which the particle changes direction. Justify your answer.

   (d) Find the total distance traveled by the particle over the time interval $0 \leq t \leq 3$.



Graph of f

5. Let f be a function defined on the closed interval $[0, 7]$. The graph of f, consisting of four line segments, is shown above. Let g be the function given by $g(x) = \int_2^x f(t)\,dt$.

   (a) Find $g(3)$, $g'(3)$, and $g''(3)$.

   (b) Find the average rate of change of g on the interval $0 \leq x \leq 3$.

   (c) For how many values c, where $0 < c < 3$, is $g'(c)$ equal to the average rate found in part (b) ? Explain your reasoning.

   (d) Find the x-coordinate of each point of inflection of the graph of g on the interval $0 < x < 7$. Justify your answer.
