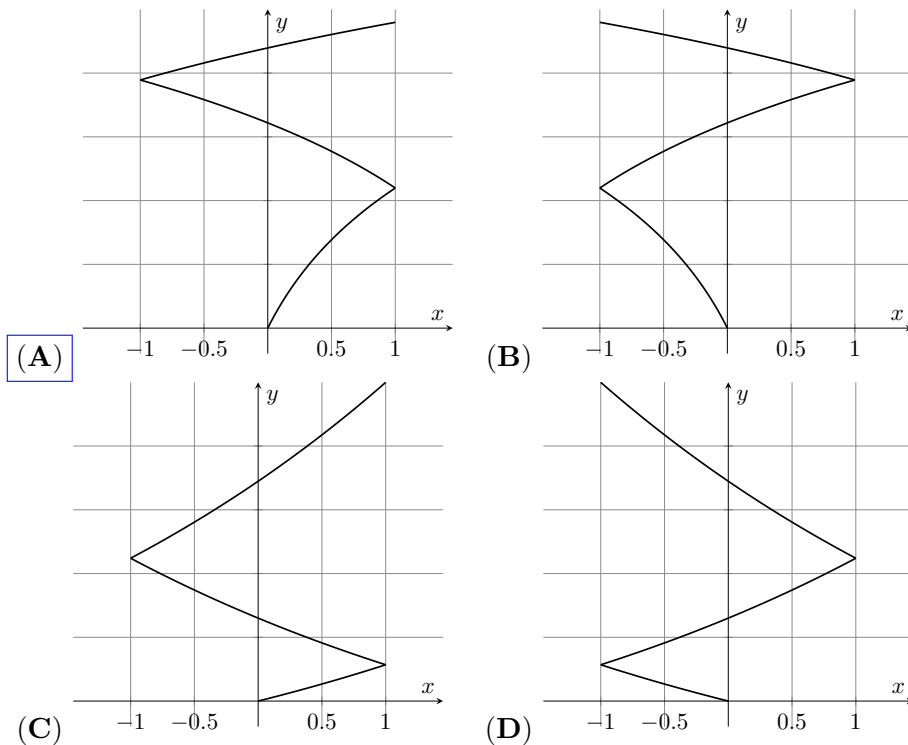


4. [6 points]

- a. [3 points] Bertie the beetle enters a different bug race. This race lasts for a thrilling 10 seconds. His position t seconds into his race is given by $(x(t), y(t))$ where

$$x(t) = \begin{cases} \frac{1}{2}t, & 0 \leq t < 2, \\ \frac{1}{2}(4 - t), & 2 \leq t < 6, \\ \frac{1}{2}(t - 8), & 6 \leq t < 10, \end{cases}$$

and where $y(t) = \ln(t + 1)$. Which of the following graphs best represents the path he follows? Circle the **one** best answer.



- b. [3 points] Carlos the centipede is training for a bug race by running in circular laps. On his first lap, Carlos' position t seconds after he began his lap is given by the parametric equations $x = f(t)$ and $y = g(t)$. For the second lap, his position t seconds after the lap begins is given by the parametric equations $x = f(2t)$ and $y = g(2t)$. How is Carlos' path in the second lap different from the first? Circle the **one** best answer from the options below.

- (I) Carlos follows a path which has the same shape as the one for the first lap, but which has half the diameter.
- (II) Carlos follows a path which has the same shape as the one for the first lap, but which has twice the diameter.
- (III) Carlos follows the same path as before but travels at half the speed.
- (IV) Carlos follows the same path as before but travels at twice the speed.