4. [14 points]
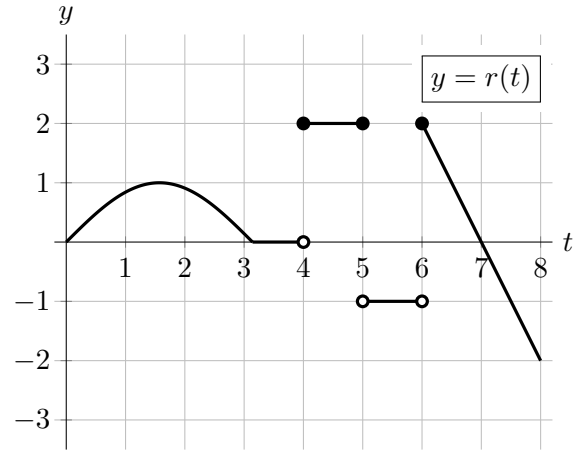
A portion of the graph of the function $r(t)$ is shown to the right. Note the following facts about $r(t)$:

- on the interval $0 < t < \pi$, we have $r(t) = \sin t$;

- $r(t) = 0$ for all $\pi \leq t < 4$; and

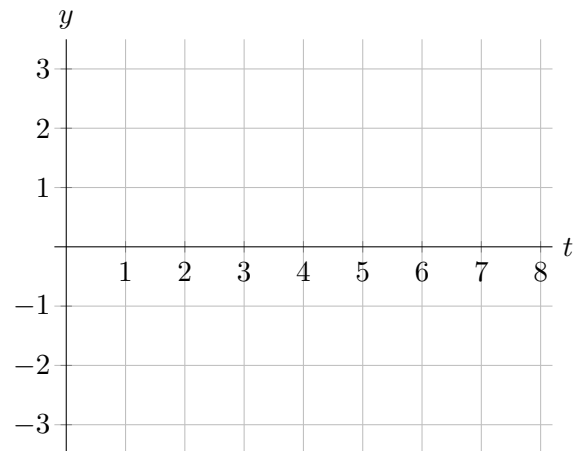- $r(t)$ is piecewise linear on the interval $\pi < t < 8$.

a. [6 points]

On the axes to the right, sketch a detailed graph of $r'(t)$, the <u>derivative</u> of $r(t)$, for $0 < t < 8$. Make sure the following are clear from your graph:

- where $r'(t)$ is undefined;

- any vertical asymptotes of $r'(t)$;

- where $r'(t)$ is zero, positive, or negative;

- where $r'(t)$ is increasing, decreasing, constant, concave up, or concave down.

b. [8 points]

Let $R(t)$ be a continuous <u>antiderivative</u> of $r(t)$ on the interval $(0, 8)$ satisfying $R(\pi) = 0$. On the axes to the right, sketch a detailed graph of $R(t)$ for $0 < t < 8$. Make sure that the following are clear from your graph:

- where $R(t)$ is and is not differentiable;

- the values of $R(t)$ at $t = 4$, 5, 6, 7, and 8, along with the limit $\lim\limits_{t \to 0^+} R(t)$;

- where $R(t)$ is increasing, decreasing, or constant;

- the concavity and any inflection points of $R(t)$.