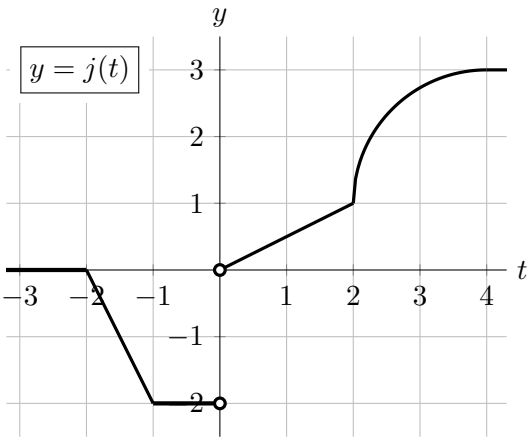
4. [14 points]

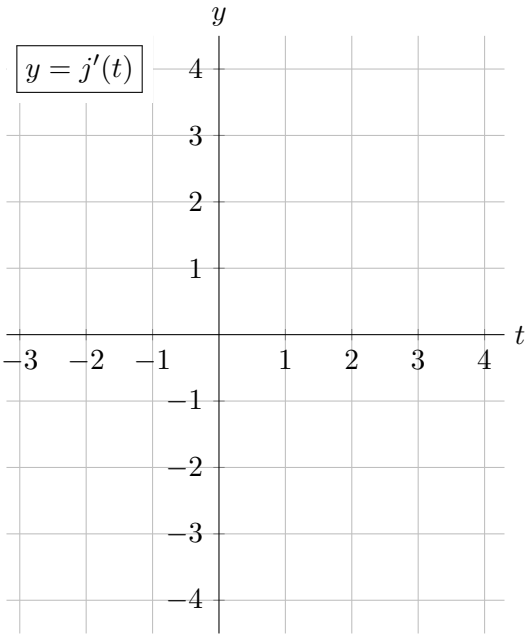
A portion of the graph of the function $j(t)$ is shown to the right. Note that, on the interval $2 \leq t \leq 4$, the graph consists of a quarter of a circle that is centered at the point $(4, 1)$.



a. [6 points]

On the axes to the right, sketch a detailed graph of $j'(t)$, the derivative of $j(t)$, for $-3 \leq t \leq 4$. Make sure that the following are clear from your graph:

- where $j'(t)$ is undefined
- any vertical asymptotes of $j'(t)$
- where $j'(t)$ is zero, positive, and negative
- where $j'(t)$ is increasing, decreasing, and constant



b. [8 points]

Let $J(t)$ be a continuous antiderivative of $j(t)$ with $J(-1) = -2$. On the axes to the right, sketch a detailed graph of $J(t)$ for $-3 \leq t \leq 4$. Make sure that the following are clear from your graph:

- where $J(t)$ is and is not differentiable
- the values of $J(t)$ at $t = -3$, -2, -1, 0, 2, and 4
- where $J(t)$ is increasing, decreasing, and constant
- where $J(t)$ is linear (with correct slope)
- the concavity of $J(t)$