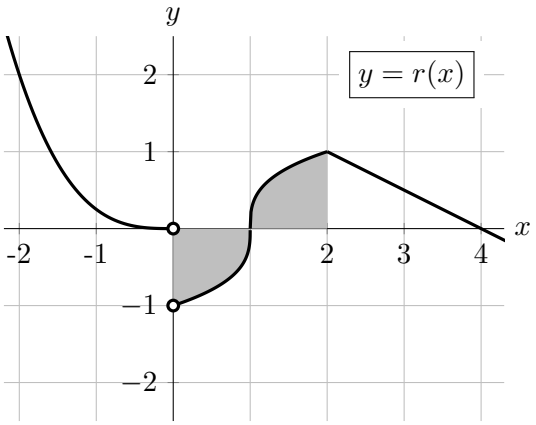
7. [14 points]

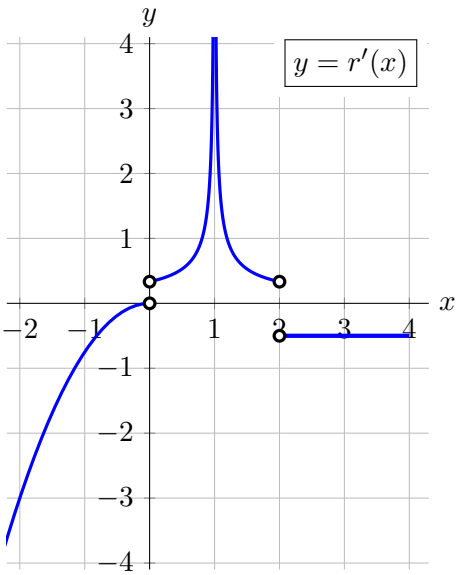
A portion of the graph of the function $r(x)$ is shown to the right. Note that:



- On the interval $-2 \le x < 0$, the function is given by the formula $-\frac{1}{4}x^3$.
- The two shaded regions each have an area of $\frac{3}{4}$.
- There is a vertical tangent line at $x = 1$ and a corner at $x = 2$.
- The graph is linear on $2 \le x \le 4$.

a. [6 points]

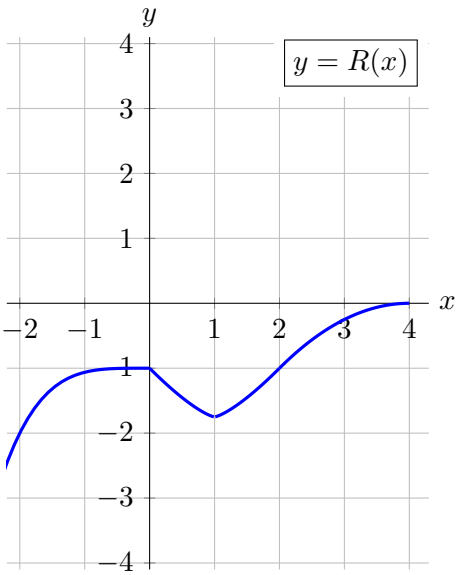
On the axes to the right, sketch a detailed graph of $r'(x)$, the derivative of $r(x)$, for $-2 \le x \le 4$. Make sure that the following are clear from your graph:



- where $r'(x)$ is undefined
- any vertical asymptotes of $r'(x)$
- where $r'(x)$ is zero, positive, and negative
- where $r'(x)$ is increasing, decreasing, and constant

b. [8 points]

Let $R(x)$ be a continuous antiderivative of $r(x)$ with $R(0) = -1$. On the axes to the right, sketch a detailed graph of $R(x)$ for $-2 \le x \le 4$. Make sure that the following are clear from your graph:



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