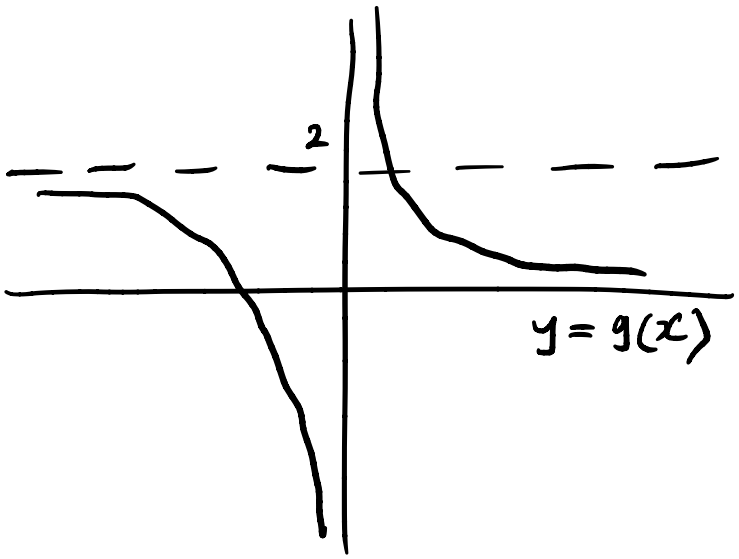
Define a function

$g(x)$ by

$g(x) = \frac{1}{x}$ when $x > 0$

$g(x) = \frac{1}{x} + 2$ when $x < 0$

Compute $g'(x)$. Explain.



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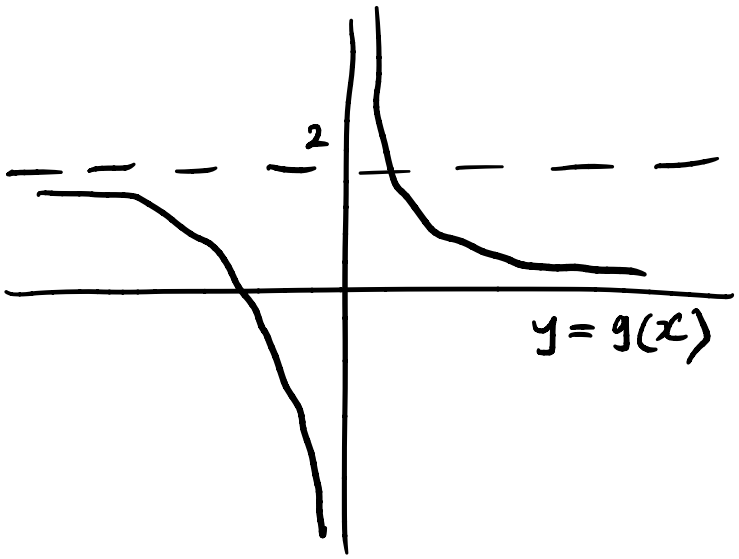

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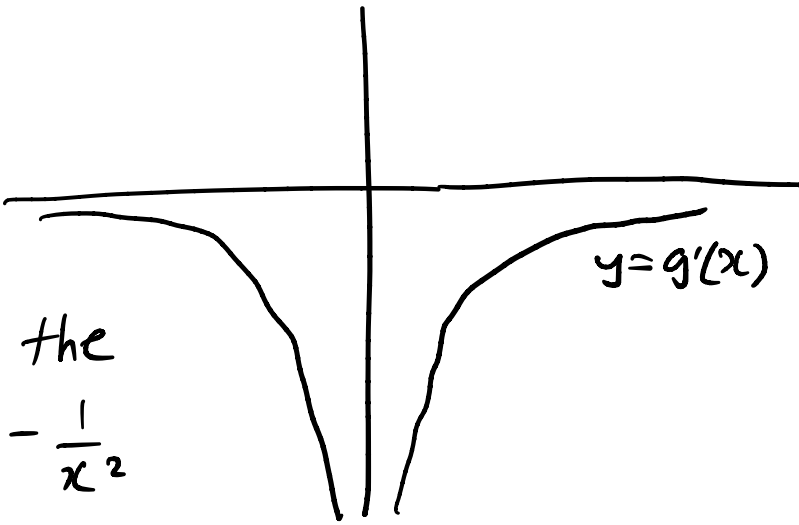
$g'(x) = -\frac{1}{x^2}$ when $x > 0$

$g'(x) = -\frac{1}{x^2}$ when $x < 0$



Explanation:

Although we know that the antiderivative of $g'(x) = -\frac{1}{x^2}$ is equal to $g(x) = \frac{1}{x}$ by the Mean Value Theorem, the MVT assumes that the function $g(x)$ is continuous and differentiable within that interval.

If the function has a discontinuity, the result of the theorem:

$g'(x) = G(x) + C$

does not have to be true.