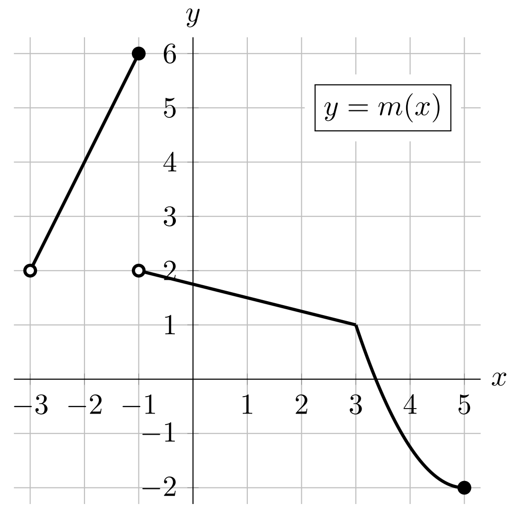
1. [9 points]



The graph of the function $m(x)$ is shown to the right. Note that:

- $m(x)$ is linear on $(-3,-1]$ and on $(-1,3]$,
- $m(x)$ is quadratic on $[3,5]$, and
- there is a corner at $x = 3$.

For parts **a.–d.**, find the **exact** values, or write DNE if the value does not exist. Your answers should not include the letter m but you do not need to simplify.

a. [1 point] Find $m''(1)$.

Answer: $m''(1) =$ 0

b. [2 points] Let $A(x) = \dfrac{m(x)}{x}$. Find $A'(-2)$.

Solution: $A'(x) = \dfrac{xm'(x) - m(x)}{x^2}$ so $A'(-2) = \dfrac{-2(2) - 4}{(-2)^2} = \dfrac{-8}{4} = -2$

Answer: $A'(-2) =$ -2

c. [2 points] Let $B(x) = m(x)\ln(3x)$. Find $B'(1)$.

Solution: $B'(x) = m(x)\dfrac{1}{3x} \cdot 3 + m'(x)\ln(3x)$ so $B'(1) = 1.5 \cdot \frac{1}{1} - \dfrac{1}{4}\ln(3)$

Answer: $B'(1) =$ $\dfrac{3}{2} - \dfrac{1}{4}\ln(3)$

d. [2 points] Let $C(x) = m^{-1}(x)$. Find $C'(1)$.

Solution: $C'(x) = \dfrac{1}{m'(m^{-1}(x))}$, so $C'(1)$ would be $\dfrac{1}{m'(m^{-1}(1))} = \dfrac{1}{m'(3)}$, but $m'(3)$ doesn't exist. Indeed, the graph of $C(x) = m^{-1}(x)$ would have a corner at $x = 1$ and so isn't differentiable there.

Answer: $C'(1) =$ **DNE**

e. [2 points] On which of the following intervals does $m(x)$ satisfy the hypotheses of the Mean Value Theorem? Circle all correct answers.

$[-1,2]$ $\qquad$ $[0,5]$ $\qquad$ $\boxed{[3,5]}$ $\qquad$ NONE OF THESE