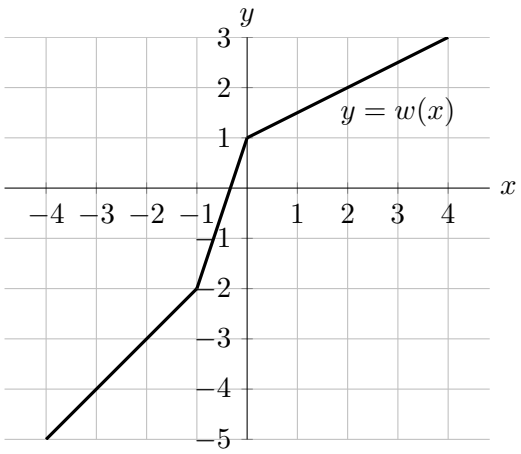
4. [10 points] A portion of the graph of the function $w(x)$ is shown below.



For each of the parts below, find the value of the given quantity. If there is not enough information provided to find the value, write NOT ENOUGH INFO. If the value does not exist, write DOES NOT EXIST. You are not required to show your work on this problem. However, limited partial credit may be awarded based on work shown. All your answers must be in **exact** form.

a. [2 points] Let $k(x) = w^{-1}(x)$. Find $k'(-1.5)$.

Solution: $k'(x) = \dfrac{1}{w'(w^{-1}(x))}$ so $k'(-1.5) = \dfrac{1}{w'(w^{-1}(-1.5))} = \dfrac{1}{w'(-5/6)} = \dfrac{1}{3}$

Answer: $k'(-1.5) =$ $\dfrac{1}{3}$

b. [2 points] Let $h(u) = \ln(3w(u))$. Find $h'(1)$.

Solution: $h'(u) = \dfrac{1}{3w(u)} 3w'(u)$ so $h'(1) = \dfrac{1}{3w(1)} \cdot 3w'(1) = \dfrac{w'(1)}{w(1)} = \dfrac{1/2}{3/2} = \dfrac{1}{3}$.

Answer: $h'(1) =$ $\dfrac{1}{3}$

c. [2 points] Let $n(x) = \dfrac{w(x)}{1-x^2}$. Find $n'(-2)$.

Solution: $n'(x) = \dfrac{w'(x)(1-x^2) - w(x)(-2x)}{(1-x^2)^2}$ so

$n'(-2) = \dfrac{w'(-2)(1-(-2)^2) - w(-2)(-2 \cdot -2)}{(1-(-2)^2)^2} = \dfrac{(1)(-3) - (-3)(4)}{3^2} = \dfrac{9}{9}$

Answer: $n'(-2) =$ 1

d. [2 points] Let $s(x)$ be the exponential function $s(x) = 4^{w(x)}$. Find $s'(2)$.

Solution: $s'(x) = \ln(4) \cdot 4^{w(x)} w'(x)$ so $s'(2) = \ln(4) \cdot 4^{w(2)} \cdot w'(2) = \ln(4) \cdot 4^2 \cdot \frac{1}{2}$

Answer: $s'(2) =$ $8\ln(4)$

e. [2 points] Let $p(x) = x \cdot w^{-1}(x)$. Find $p'(-1)$.

Solution: $p'(x) = 1 \cdot w^{-1}(x) + x \cdot \dfrac{1}{w'(w^{-1}(x))}$ so $p'(-1) = -\dfrac{2}{3} + -1 \cdot \dfrac{1}{3} = -1$

Answer: $p'(-1) =$ -1