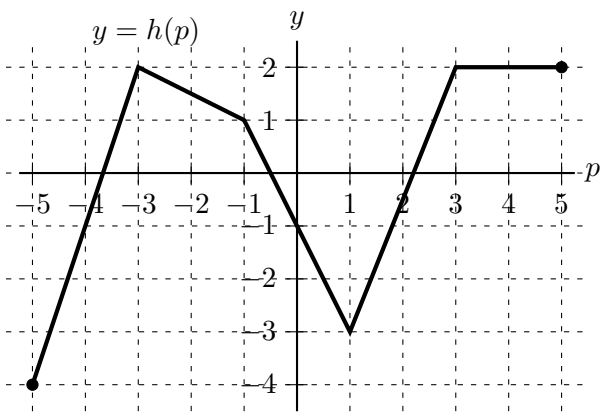
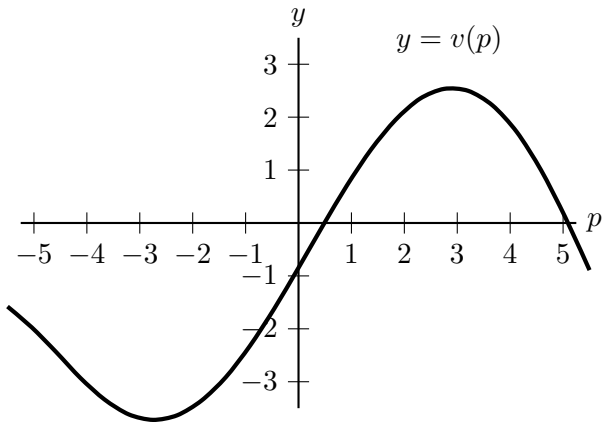
1. [12 points] The graphs of two functions, $h(p)$ and $v(p)$, are shown below.





The following questions concern the functions B, W, and Q defined as follows:

$$B(p) = \frac{h(2p)}{h(4p)}, \qquad W(p) = h(h(p)), \quad \text{and} \quad Q(p) = e^{-v(p)}.$$

Assume that the first and second derivatives of $v(p)$ are defined everywhere, i.e. that both v and v' are differentiable on $(-\infty, \infty)$. Note that the graph of $h(p)$ consists of line segments whose endpoints have integer (whole number) coordinates. Find the <u>exact</u> value of each of the quantities in **a.** and **b.** below. If the value does not exist, write DOES NOT EXIST. *Remember to show your work carefully.*

a. [4 points] $B'(-1)$

Answer: $B'(-1) =$ _____

b. [4 points] $W'(2)$

Answer: $W'(2) =$ _____

c. [4 points] On the interval $-2 < p < 2$, is $Q(p)$ always increasing, always decreasing, or neither? Show your work and explain your reasoning.