(1) Given the graph of $h(x)$ shown below, evaluate each of the following limits.

\[ \lim_{x \to 2^+} h(x) \]
\[ \lim_{x \to 2} h(x) \]
\[ \lim_{x \to 5} h(x) \]
\[ \lim_{x \to 4^+} h(x) \]
\[ \lim_{x \to 2^-} h(x) \]

(2) Evaluate each limit. No work required.

\[ \lim_{x \to \infty} \frac{x^3}{3x^3 + 1} \]
\[ \lim_{x \to 2} \frac{x + 2}{x} \]
\[ \lim_{x \to 2} \frac{4}{|w - 4|} \]
\[ \lim_{x \to \infty} \frac{5x^4}{2x^3 + x} \]
\[ \lim_{x \to 3} \frac{x^2}{2x} \]
\[ \lim_{z \to \infty} \frac{4z^4}{2z^3 + 1} \]
(3) Find each limit. Justify your answers by doing/showing analytic work.

\[
\lim_{x \to \infty} \frac{3x^3 - 6x + 2}{2 - 6x^3}
\]

\[
\lim_{x \to 2} \frac{x^2 + x}{x^2 - x - 2}
\]

\[
\lim_{z \to \infty} \frac{4z^5 - 2z + 3}{8z^3 - 4z + 2}
\]

\[
\lim_{x \to 3} \frac{\sqrt{x+1}}{x - 3}
\]
(4) Let \( k(x) = \begin{cases} x, & \text{x is an integer} \\ 0, & \text{x is not an integer} \end{cases} \).

Find each of the following:

\[
\begin{align*}
k(2) &= \\
\lim_{x \to 2^-} k(x) &= \\
\lim_{x \to 2^+} k(x) &= \\
\lim_{x \to 2} k(x) &=
\end{align*}
\]

Is \( k \) continuous at \( x = 2 \). (Answer only.)

Is \( k \) continuous at \( x = 0 \)? (Answer and explain.)

For what values of \( x \) is \( k \) discontinuous?

(5) Let \( f(x) = \begin{cases} x^2 + 1, & x \leq 1 \\ 4, & x > 1 \end{cases} \). Is \( f \) continuous at \( x = 1 \)? Justify your answer using the definition of continuity.