True/False (1 pt. each)
From the graph below, determine whether the following statements are true or false. Answer "True" or "False" to the following questions, rather than simply "T" or "F".

1. True \( \lim_{x \to 0} f(x) \) exists.
2. False \( \lim_{x \to 0} f(x) = 1. \)
3. True \( \lim_{x \to 0} f(x) = 0. \)
4. False \( \lim_{x \to 1} f(x) = 1. \)
5. False \( \lim_{x \to 1} f(x) = 0. \)
6. True \( \lim_{x \to x_0} f(x) \) exists at every point \( x_0 \) in \((-1, 1)\).

Problem Section
Solve each of the following problems. Show all of your work. (i.e. \( u = 1-5x \), etc.)

1. (4 points) Sketch the interval \((a, b)\) on the \(x\)-axis with the point \(x_0\) inside. Then find a value of \( \delta > 0 \) such that for all \( x \), \( 0 < |x - x_0| < \delta \implies a < x < b. \)

\[
a = -\frac{7}{2}, \quad b = -\frac{1}{2}, \quad x_0 = -\frac{3}{2}
\]

\[
\delta = \min \left( \frac{1}{2}, \frac{1}{2} \right) = 1.
\]

You could also have picked \( \delta \leq 1 \).
2. (10 points) Find an open interval about $x_0$ on which the inequality $|f(x) - L| < \epsilon$ holds. Then, give a value for $\delta > 0$ such that for all $x$ satisfying $0 < |x - x_0| < \delta$, the inequality $|f(x) - L| < \epsilon$ holds.

**NOTE:** You aren't being asked to write a formal proof. Just find a $\delta$ that works.

$$f(x) = \sqrt{x + 1}$$
$$L = 1$$
$$x_0 = 0$$

You can do this problem the same way you would do it if $\epsilon$ was given to you. [Say $\epsilon = 0.5$ for example.]

$$|f(x) - L| < \epsilon$$
$$|\sqrt{x+1} - 1| < \epsilon$$

$$-\epsilon < \sqrt{x+1} - 1 < \epsilon$$
$$-\epsilon + 1 < \sqrt{x+1} < 1 + \epsilon$$

$$(1-\epsilon)^2 < x+1 < (1+\epsilon)^2$$

This step is really only allowed when each term is greater than or equal to zero.

Note that in this problem $x_0 = 0$ and so we're looking for

$$-\delta < x < \delta.$$ 

Thus, $\delta = \min\left(\|(1-\epsilon)^2-1\|, \|(1+\epsilon)^2-1\|\right)$. 