Continuity

1. Consider the piecewise-defined function

\[ f(x) = \begin{cases} 
  \frac{(x + 3)(x + 4)}{x + 4} & \text{if } x < -2 \\
  1 & \text{if } -2 \leq x \leq 0 \\
  -1 + \log_2 x & \text{if } 0 < x 
\end{cases} \]

(a) Draw the graph of \( f \) on the axis below.

2. Find \( \lim_{x \to -2} f(x) \) either numerically or graphically.

3. Find \( f(-2) \)

4. Is \( f \) continuous at \( x = -2 \)?
5. Let \( g \) be the piece-wise defined function below. This means the graph of \( g \) is the entire dotted graph shown below.

\[(a) \text{ Is } g \text{ continuous at:} \]
\[ x = 0 \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad x = 2 \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad x = 3? \]

\[(b) \text{ Find all the } x \text{ coordinates where } g \text{ is discontinuous.} \]

6. Sketch a graph of a function \( \alpha \) that satisfies all of the following:
\[ \alpha(-1) = -3, \quad \lim_{x \to -1^+} \alpha(x) = 2, \quad \alpha \text{ is continuous on } (0, 3), \quad \text{and not continuous at } x = 4. \]