Continuity

While working in a group make sure you:

- Expect to make mistakes but be sure to reflect/learn from them!
- Are civil and are aware of your impact on others.
- Assume and engage with the strongest argument while assuming best intent.

1. Consider the piecewise-defined function

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

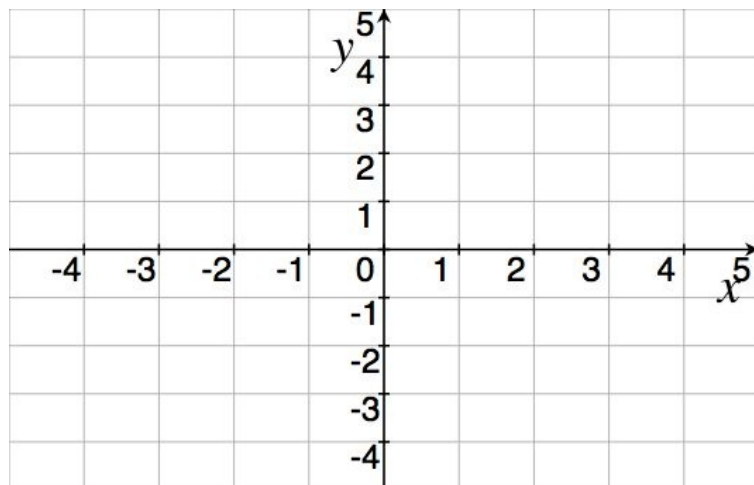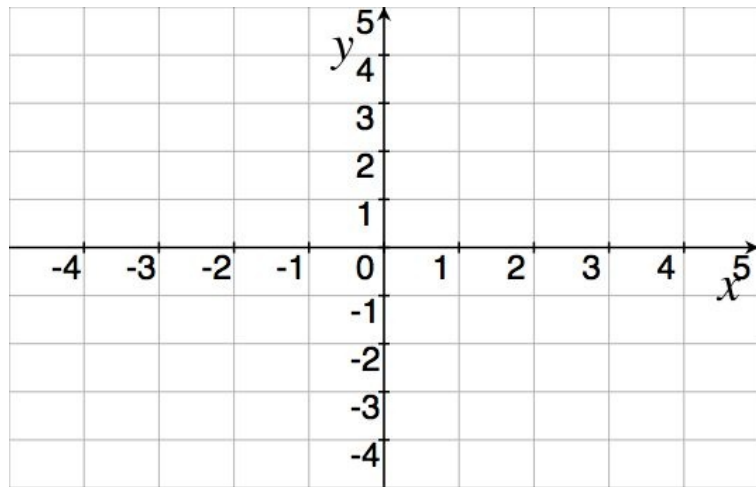   (a) Draw the graph of f on the axis to the right.

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

3. Find $f(-2)$

4. Is f continuous at $x = -2$?

5. Sketch a graph of a function α that satisfies *all* of the following:

   $\alpha(-1) = -3,\quad \lim\limits_{x \to -1^+} \alpha(x) = 2,\quad \alpha$ is continuous on $(0,3),\quad$ and not continuous at $x = 4$.

$$\lim_{x \to \pm\infty} f(x)$$

Find the positive horizontal asymptote(s) if they exist for each of the following:

$$\frac{2x - 1}{x + 1} \qquad\qquad\qquad\qquad \frac{3x^2 - x - 2}{5x^2 + 4x + 1}$$

$$x^2 - x \qquad\qquad\qquad\qquad \frac{\sqrt{2x^2 + 1}}{3x - 5}$$

$$\frac{2x^3 + 5}{3x^2 + 1} \qquad\qquad\qquad\qquad \frac{2x + 5}{3x^2 + 1}$$