Math 261 – Summer Lab 4   **Continuity and More Limits**   Name_____

Show all work for credit. Also, give exact answers unless otherwise noted.

1. Sketch the graph of a function f such that the following limits hold.

$$\lim_{x \to \infty} f(x) = 6 \qquad \lim_{x \to -6^-} f(x) = -\infty$$
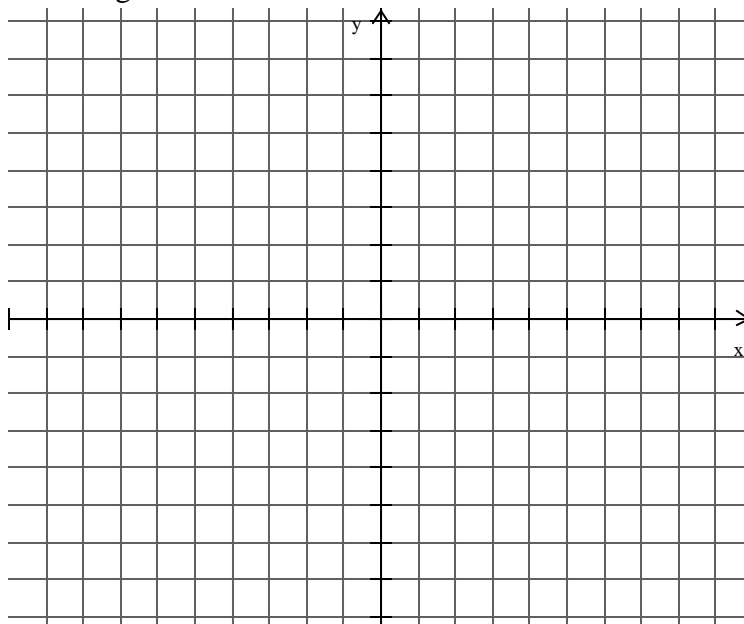
$$\lim_{x \to -\infty} f(x) = -5 \qquad \lim_{x \to -6^+} f(x) = \infty$$

$$\lim_{x \to 1^-} f(x) = \infty \qquad \lim_{x \to 5^-} f(x) = -\infty$$
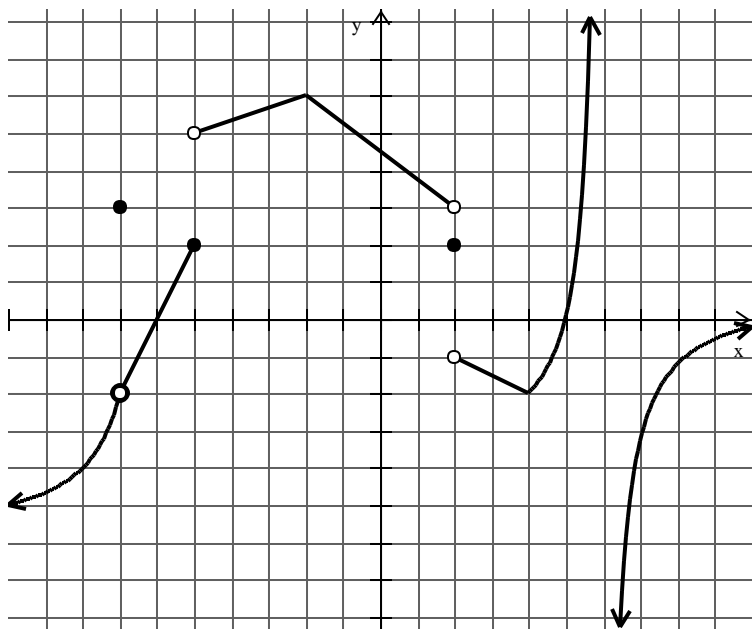
$$\lim_{x \to 1^+} f(x) = \infty \qquad \lim_{x \to 5^+} f(x) = \infty$$

2. A function p is graphed below. From the graph, find the following. Justify each answer.

(a) Where does p have a removable discontinuity, if anywhere?

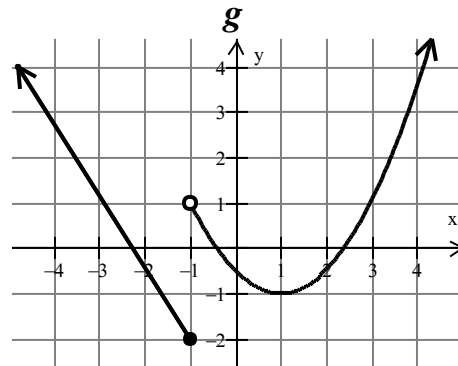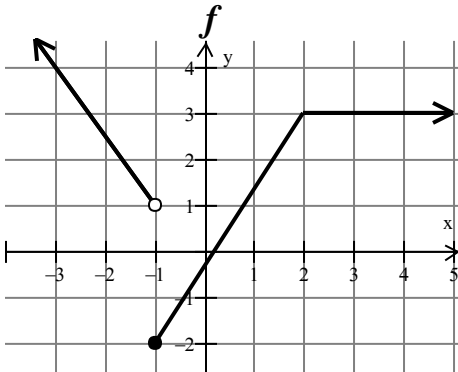(b) Where does p have a jump discontinuity, if anywhere?

(c) Where does p have an infinite discontinuity, if anywhere?

(d) Where is p continuous, if anywhere?

3. Use the graphs for *f* and *g* to determine the continuity at −1 for: *Justify your answers.*

   (a) *f* + *g* (b) *f* − *g*

4. Find and classify all discontinuities for each of the following functions. *Justify your answers.*

   (a) $h(t) = \dfrac{3t^2 + 7t - 6}{2t^2 + 5t - 3}$

   (b) $s(\varphi) = \cot \varphi$

   (c) $q(r) = \begin{cases} 3r - 2 & \text{if } r < 4 \\ 2r + 1 & \text{if } r \geq 4 \end{cases}$

   (d) $w(a) = \begin{cases} |a + 2| & \text{if } a < -1 \\ 1 & \text{if } a = -1 \\ 3a^2 - \sqrt{a + 5} & \text{if } a > -1 \end{cases}$