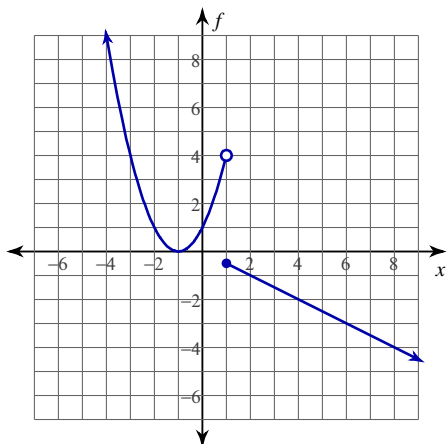


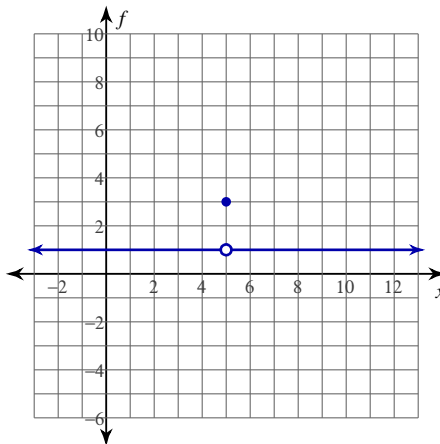
# Continuity

**Find the intervals on which each function is continuous.**

$$1) f(x) = \begin{cases} x^2 + 2x + 1, & x < 1 \\ -\frac{x}{2}, & x \geq 1 \end{cases}$$

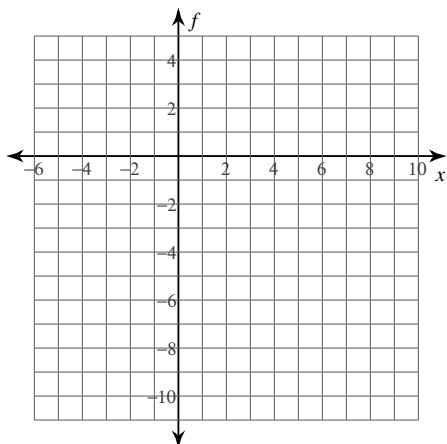


$$2) f(x) = \begin{cases} 1, & x \neq 5 \\ 3, & x = 5 \end{cases}$$

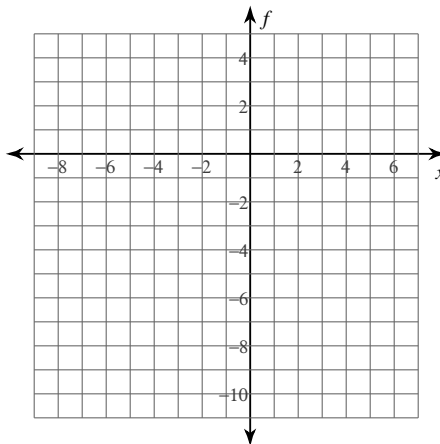


**Find the intervals on which each function is continuous. You may use the provided graph to sketch the function.**

$$3) f(x) = \begin{cases} 2x - 10, & x < 2 \\ 0, & x \geq 2 \end{cases}$$



$$4) f(x) = \frac{x^2 - x - 2}{x + 1}$$



**Find the intervals on which each function is continuous.**

$$5) f(x) = \frac{x^2}{2x+4}$$

$$6) f(x) = \begin{cases} -\frac{x}{2} - \frac{7}{2}, & x \leq 0 \\ -x^2 + 2x - 2, & x > 0 \end{cases}$$

$$7) f(x) = -\frac{x^2 - x - 12}{x+3}$$

$$8) f(x) = \frac{x^2 - x - 6}{x+2}$$

**Determine if each function is continuous. If the function is not continuous, find the  $x$ -axis location of and classify each discontinuity.**

$$9) f(x) = -\frac{x^2}{2x+4}$$

$$10) f(x) = \frac{x+1}{x^2 - x - 2}$$

$$11) f(x) = \frac{x+1}{x^2 + x + 1}$$

$$12) f(x) = -\frac{x^2}{x-1}$$

$$13) f(x) = \begin{cases} x^2 - 4x + 3, & x \neq 0 \\ 3, & x = 0 \end{cases}$$

$$14) f(x) = \begin{cases} -x^2, & x \neq 1 \\ 0, & x = 1 \end{cases}$$

**Critical thinking questions:**

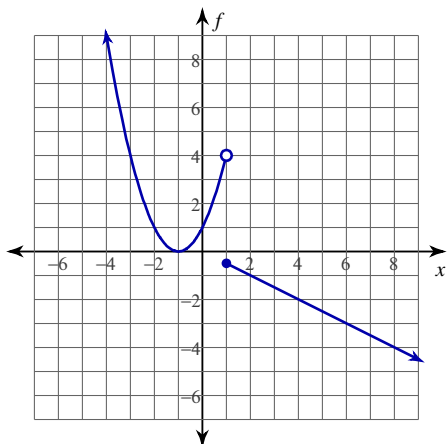
15) Give an example of a function with discontinuities at  $x = 1, 2,$  and  $3.$

16) Of the six basic trigonometric functions, which are continuous over all real numbers? Which are not? What types of discontinuities are there?

## Continuity

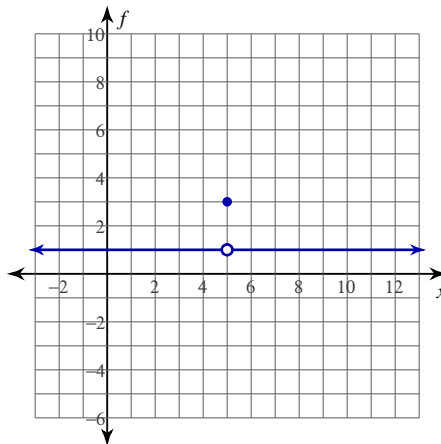
Find the intervals on which each function is continuous.

$$1) f(x) = \begin{cases} x^2 + 2x + 1, & x < 1 \\ -\frac{x}{2}, & x \geq 1 \end{cases}$$



$(-\infty, 1), [1, \infty)$

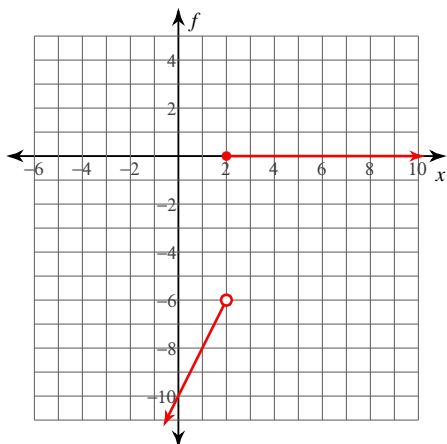
$$2) f(x) = \begin{cases} 1, & x \neq 5 \\ 3, & x = 5 \end{cases}$$



$(-\infty, 5), (5, \infty)$

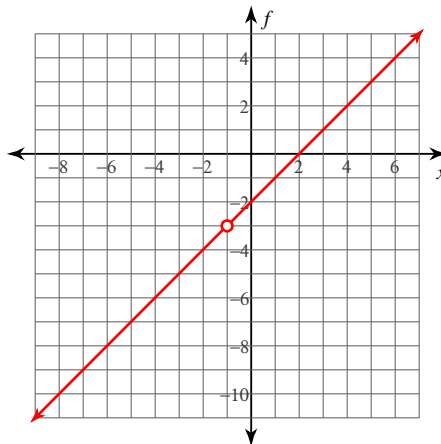
Find the intervals on which each function is continuous. You may use the provided graph to sketch the function.

$$3) f(x) = \begin{cases} 2x - 10, & x < 2 \\ 0, & x \geq 2 \end{cases}$$



$(-\infty, 2), [2, \infty)$

$$4) f(x) = \frac{x^2 - x - 2}{x + 1}$$



$(-\infty, -1), (-1, \infty)$

Find the intervals on which each function is continuous.

$$5) f(x) = \frac{x^2}{2x+4}$$

$(-\infty, -2), (-2, \infty)$

$$6) f(x) = \begin{cases} -\frac{x}{2} - \frac{7}{2}, & x \leq 0 \\ -x^2 + 2x - 2, & x > 0 \end{cases}$$

$(-\infty, 0], (0, \infty)$

$$7) f(x) = -\frac{x^2 - x - 12}{x+3}$$

$(-\infty, -3), (-3, \infty)$

$$8) f(x) = \frac{x^2 - x - 6}{x+2}$$

$(-\infty, -2), (-2, \infty)$

Determine if each function is continuous. If the function is not continuous, find the  $x$ -axis location of and classify each discontinuity.

$$9) f(x) = -\frac{x^2}{2x+4}$$

Essential discontinuity at:  $x = -2$

$$10) f(x) = \frac{x+1}{x^2 - x - 2}$$

Removable discontinuity at:  $x = -1$   
Essential discontinuity at:  $x = 2$

$$11) f(x) = \frac{x+1}{x^2 + x + 1}$$

Continuous

$$12) f(x) = -\frac{x^2}{x-1}$$

Essential discontinuity at:  $x = 1$

$$13) f(x) = \begin{cases} x^2 - 4x + 3, & x \neq 0 \\ 3, & x = 0 \end{cases}$$

Continuous

$$14) f(x) = \begin{cases} -x^2, & x \neq 1 \\ 0, & x = 1 \end{cases}$$

Removable discontinuity at:  $x = 1$

Critical thinking questions:

15) Give an example of a function with discontinuities at  $x = 1, 2,$  and  $3$ .

Many answers.  $\frac{1}{(x-1)(x-2)(x-3)}$

16) Of the six basic trigonometric functions, which are continuous over all real numbers? Which are not? What types of discontinuities are there?

Cont: sin, cos. Not cont: sec, csc, tan, cot. Essential.