

For each of the following functions, sketch a graph of the function and give its domain. Determine if the function is continuous at $x = 2$ and if so, what its value is at $x = 2$. If the function is not continuous at $x = 2$, then determine if it has a limit at $x = 2$ and what that limit is.

1. $f(x) = x^2 - 4x + 4,$

2. $f(x) = \frac{1}{x + 1},$

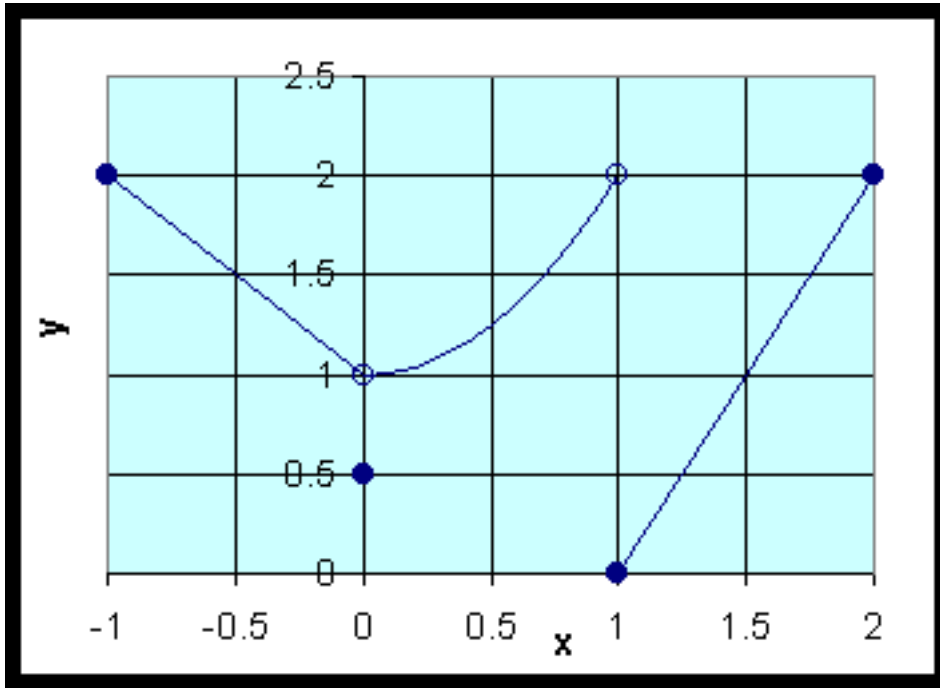
3. $f(x) = \frac{1}{x^2 - 4},$

4. $f(x) = \frac{x^2 + x - 6}{x - 2},$

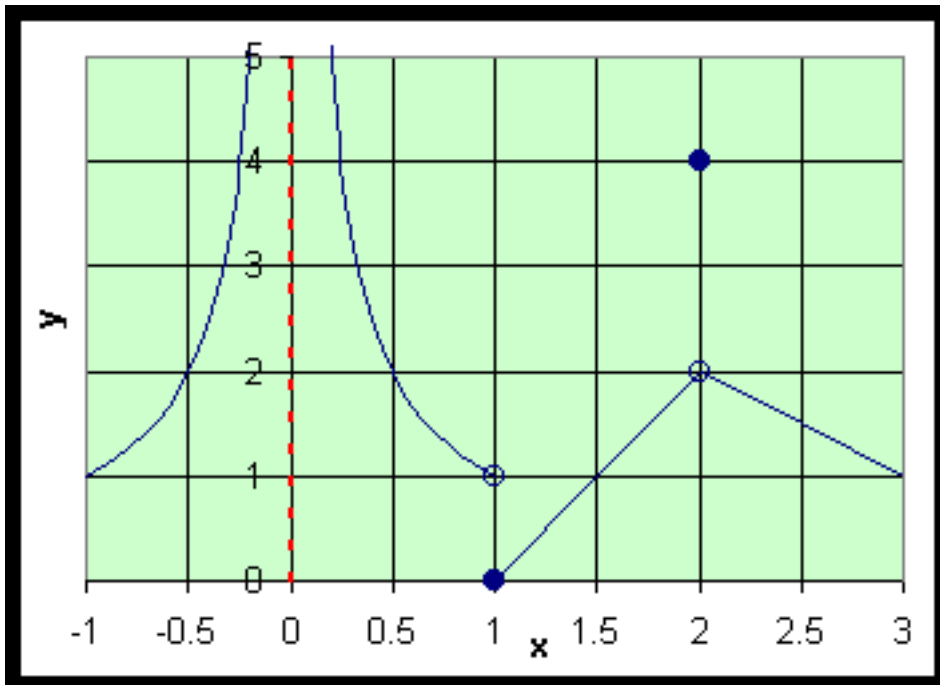
5. $f(x) = \ln(x - 1),$

6. $f(x) = \sqrt{9 - x^2}.$

7. Below is a graph of a function defined for $x \in [-1, 2]$. At $x = 0$ and $x = 1$, determine what the function value is (if it exists). Also, find the limit as $x \rightarrow 0$ and $x \rightarrow 1$, if the limits exist. Where is this function continuous?



8. Below is a graph of a function. What is the domain of this function? At $x = 0, 1, 2$, determine what the function value is (if it exists). Also, find the limit as $x \rightarrow 0$, $x \rightarrow 1$, and $x \rightarrow 2$, if the limits exist. Where is this function continuous?



9. Use the definition of the derivative to find the derivative of the following functions.

a. $f(x) = x^3$,

b. $f(x) = 3x - x^2$,

c. $f(x) = \sqrt{4 - x}$,

d. $f(x) = \frac{2}{x + 3}$.