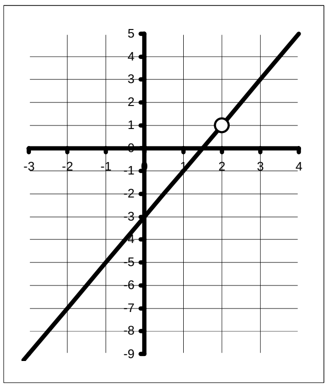
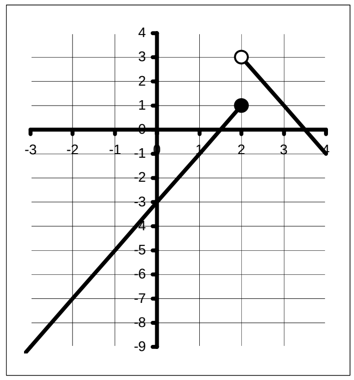
MA 181 Continuity of Functions
Section 2.4

1. Informally, a function f is continuous at x = a if the function does not have a hole, jump or break of some kind at x = a. There are five functions pictured below. Which of these five do you think is continuous at x = 2?

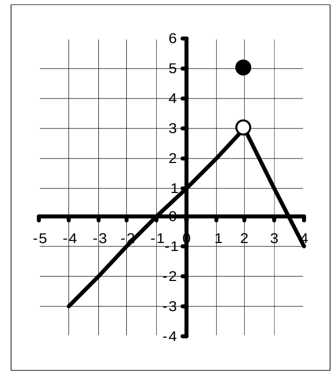
(a)



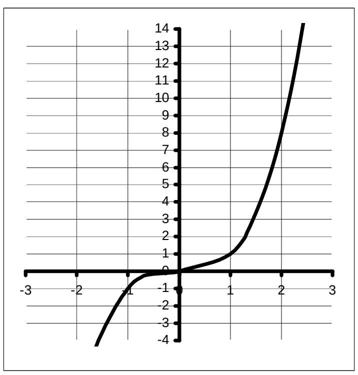
(b)



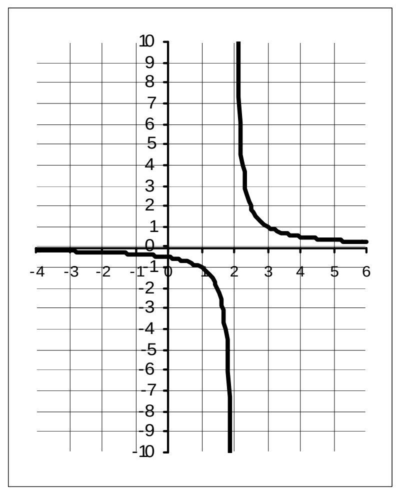
(c)



(d)



(e)



2. For each function above, find $f(2)$, $\lim_{x\to 2^-} f(x)$, $\lim_{x\to 2^+} f(x)$, and $\lim_{x\to 2} f(x)$.

(a) $f(2) =$ $\lim_{x\to 2^-} f(x) =$ $\lim_{x\to 2^+} f(x) =$ $\lim_{x\to 2} f(x) =$

(b) $f(2) =$ $\lim_{x\to 2^-} f(x) =$ $\lim_{x\to 2^+} f(x) =$ $\lim_{x\to 2} f(x) =$

(c) $f(2) =$ $\lim_{x\to 2^-} f(x) =$ $\lim_{x\to 2^+} f(x) =$ $\lim_{x\to 2} f(x) =$

(d) $f(2) =$ $\lim_{x\to 2^-} f(x) =$ $\lim_{x\to 2^+} f(x) =$ $\lim_{x\to 2} f(x) =$

(e) $f(2) =$ $\lim_{x\to 2^-} f(x) =$ $\lim_{x\to 2^+} f(x) =$ $\lim_{x\to 2} f(x) =$

3. Look at your results for questions 1 and 2 for each function. Based on these results, write a definition for continuity:

A function f is said to be continuous at x = a if

4. Explain why or why not each function below is continuous at the specified value of x, using the definition above:

(a) $f(x) = \dfrac{1}{x-2}$ at x = 2

(b) $g(x) = \begin{cases} 3x+4 & if \;\; x \le 1 \\ 4x-1 & if \;\; x > 1 \end{cases}$ at x = 1

(c) $h(x) = \begin{cases} 8 & if \;\; x = 4 \\ \dfrac{x^2-16}{x-4} & if \;\; x \ne 4 \end{cases}$ at x = 4

(d) $m(x) = \begin{cases} x^2-4 & if \;\; x < 3 \\ 0 & if \;\; x = 3 \\ x+2 & if \;\; x > 3 \end{cases}$ at x = 3

5. Find the values of a and b so that the function

$$f(x) = \begin{cases} ax+b & if \;\; x < 2 \\ 5 & if \;\; x = 2 \\ x^2+a & if \;\; x > 2 \end{cases}$$