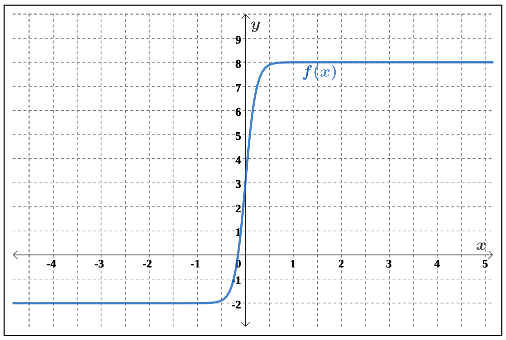
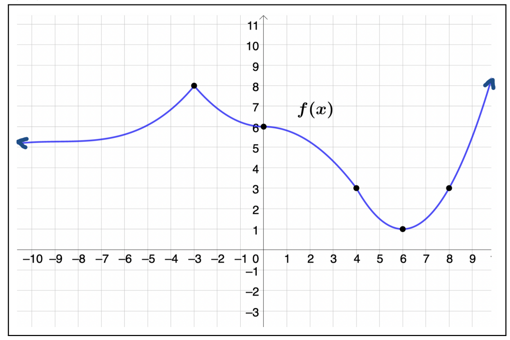
Session 2: Sections 1-3 and 1-4

(1) Use the graph of f to estimate $\lim_{x\to\infty} f(x)$ and $\lim_{x\to-\infty} f(x)$. If a limit does not exist because the function has infinite behavior, use limit notation to describe the infinite behavior.

(a)



(b)



(2) Find

(a) $\lim_{x\to\infty} 5e^{-4x}$

(b) $\lim_{x\to-\infty} \dfrac{4x^2+7x^3-9}{-x^3-7x+8}$

(c) $\lim_{x\to\infty} \dfrac{4x^3-8x^{10}+4x^6}{8x^2-7x+5}$

(d) $\lim_{x\to\infty} \dfrac{5e^{7x}}{e^{-2x}+9}$

(e) $\lim_{x\to-\infty} \dfrac{-4e^{2x}-5e^{-2x}}{10+e^{-3x}+7e^{4x}}$

(3) Find any horizontal asymptotes for the functions below. If there are no horizontal asymptotes, describe the end behavior using limit notation.

(a) $f(x) = \dfrac{-9x^2+3x}{2x^2-5}$

(b) $g(x) = \dfrac{-2x^3+4}{3x^2+7x}$

(c) $h(x) = \begin{cases} \dfrac{e^{-10x}-e^{3x}}{4e^{2x}-5e^{-x}} & x \le -2 \\ \dfrac{x^2-x}{x^4-x^2} & x > -2 \end{cases}$

(4) Find the x-values of any holes and vertical asymptotes of the functions below.

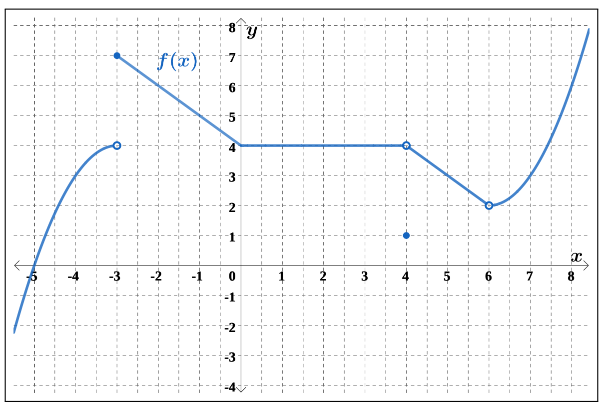
(a) $f(x) = \dfrac{(x+7)(x-9)}{(x-9)(4x-5)}$

(b) $f(x) = \dfrac{(2x+7)^2(x-4)}{(x+3)(2x+7)}$

(c) $f(x) = \dfrac{(5x-17)(x+4)}{(3x-8)(x+4)^2}$

(d) $f(x) = \dfrac{x^2+3x-28}{x^2-x-12}$

(5) Use the graph of f to determine the x-value(s) where f is discontinuous. State the condition in the definition of continuity at a point that fails first at each x-value.



(6) Determine if the functions below are continuous at the given value of c. If the function is not continuous at $x = c$, also state the condition in the definition of continuity at a point that fails first mathematically.

(a) $f(x) = \dfrac{2x^2-x-15}{3x^2-2x-16}, \quad c = 10$

(b) $f(x) = \begin{cases} 4x+7 & x \leq 2 \\ 3x-5 & x > 2 \end{cases}, \quad c = 2$

(7) Using an algebric method, determine where the functions below are continuous. Write your answer using interval notation.

(a) $f(x) = 2x^3 - \sqrt{x} + \ln(2x-8)$

(b) $f(x) = \dfrac{x^2-3x-10}{\sqrt[6]{2x-7}}$

(c) $f(x) = \dfrac{\sqrt[3]{x^3 - 4x^2 + 8}}{e^{x-5}}$

(d) $f(x) = \dfrac{4\ln(x-8)}{\sqrt{5x-3}}$

(e) $f(x) = \begin{cases} \dfrac{4x-7}{x+5} & x \leq 3 \\ \sqrt{3x-7} & x > 3 \end{cases}$

(f) $f(x) = \begin{cases} -3x^4 + 2x - 1 & x < -7 \\ 5e^{x-2} + 16 & -7 < x \leq 2 \\ 8x^2 - 11 & x > 2 \end{cases}$

(8) Find the value(s) of k that make(s) the function continuous for all real numbers. If there is no such value of k, explain why.

(a) $f(x) = \begin{cases} 2x^2 + k & x < 2 \\ 3x - 8 & x \geq 2 \end{cases}$

(b) $f(x) = \begin{cases} 3^{x-4} & x \leq 5 \\ 2x^2 - kx + 4 & x > 5 \end{cases}$

(9) Find the value(s) of k that make(s) the following function continuous at $x = 8$. If there is no such value of k, explain why.

$$f(x) = \begin{cases} 13e^{8-x} - 2 & x \leq 8 \\ 1 - k & x > 8 \end{cases}$$