

1.)

For each of the functions listed, **(i)** identify any points of discontinuity and **(ii)** say whether it is continuous from the left, right, or neither.

a.)

$$f(x) = \frac{x+4}{2x^2+7x-4}$$

b.)

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

c.)

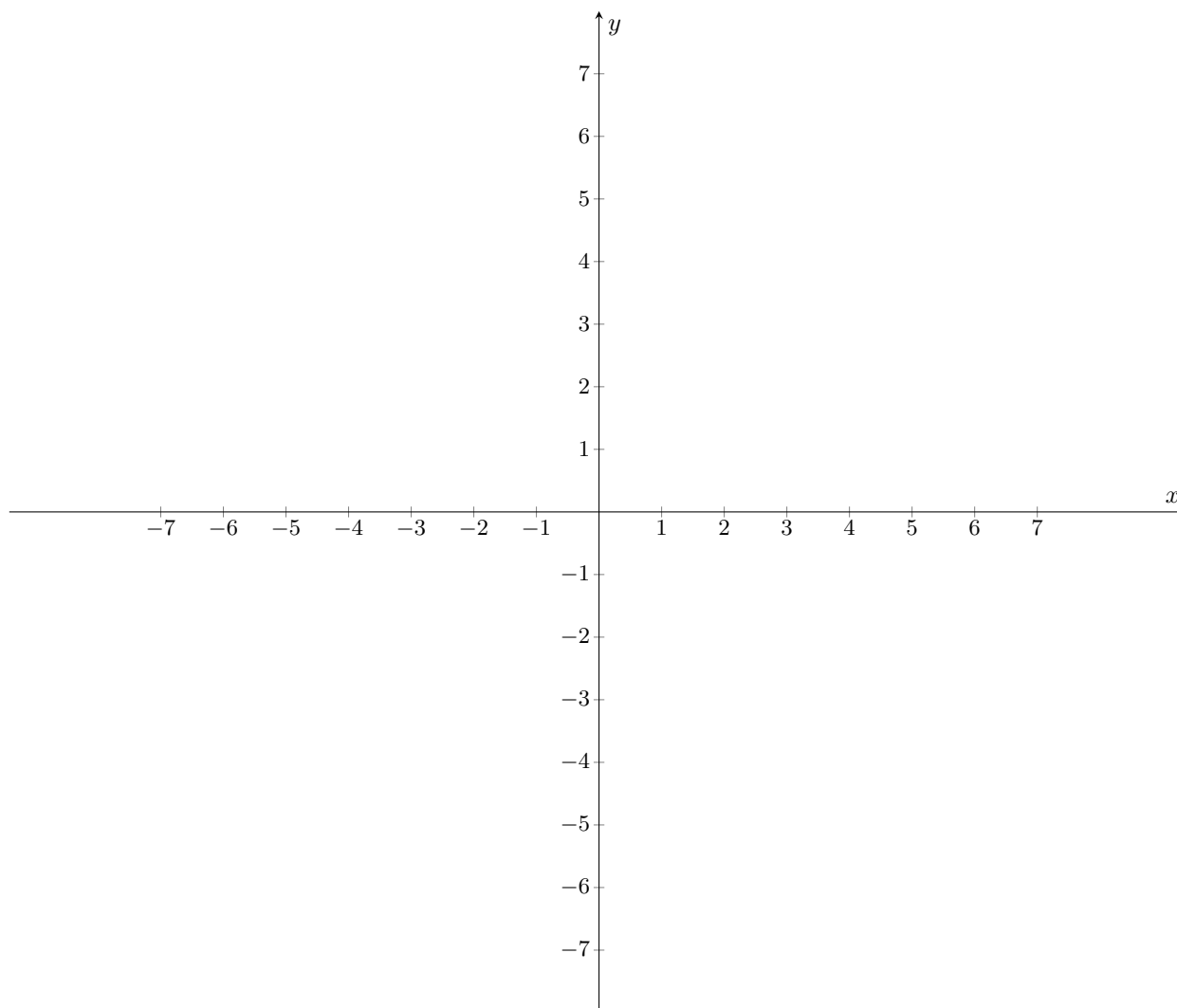
$$f(x) = \begin{cases} \sqrt{1-x} & x \leq 1 \\ \frac{2x^3-2}{x-2} & 1 < x \leq 3 \\ 52 \sin(\pi x) & 3 < x \end{cases}$$

2.)

Sketch a graph $y = f(x)$ for a function f satisfying *all* of the following properties (you do not need to provide a formula for f unless you want to):

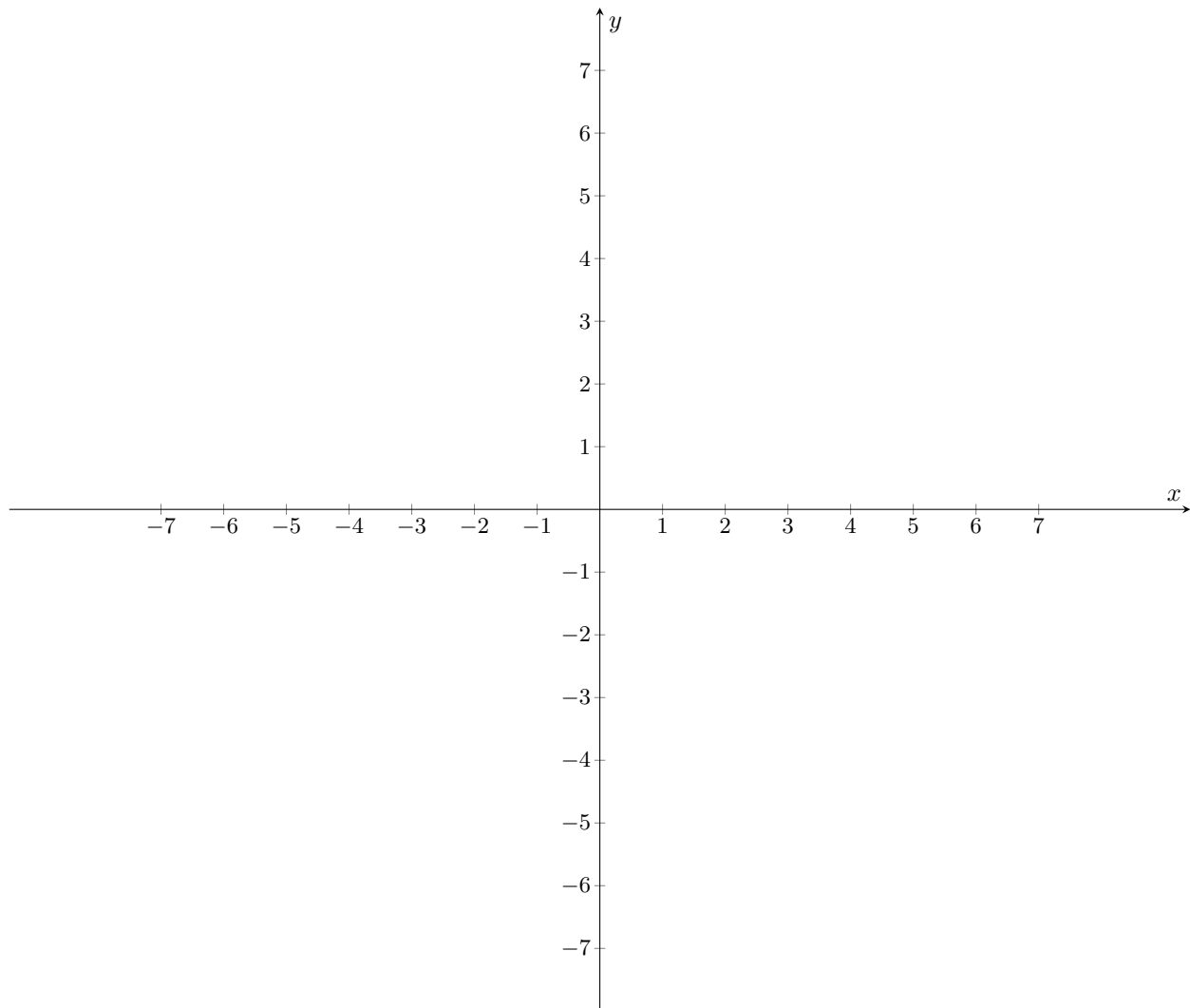
a.)

$\lim_{x \rightarrow -\infty} f(x) = 0$, $\lim_{x \rightarrow -2^+} f(x) = 3$, $\lim_{x \rightarrow -2^-} f(x) = -3$, $\lim_{x \rightarrow 3} f(x) = -\infty$, f is continuous *from the right* at $x = -3$



b.)

$\lim_{x \rightarrow -\infty} f(x) = -3$, $\lim_{x \rightarrow -1^+} f(x) = -2$, $\lim_{x \rightarrow 0} f(x) = -\infty$, $\lim_{x \rightarrow 2} f(x) = 3$, $f(2) = 6$,
 $\lim_{x \rightarrow \infty} f(x) = 2$, there are only two real numbers at which f is *not* continuous.



3.)

Evaluate the following limits.

a.)

$$\lim_{x \rightarrow 2} \frac{1}{x-2}$$

b.)

$$\lim_{x \rightarrow 2} \frac{1}{(x-2)^2}$$

c.)

$$\lim_{x \rightarrow \infty} \frac{2+5x^2}{1+x-x^2}$$

d.)

$$\lim_{x \rightarrow -\infty} \frac{1-x^6}{1+x^5}$$

e.)

$$\lim_{x \rightarrow \infty} \frac{\sqrt{1+4x^6}}{2-x^3}$$

f.)

$$\lim_{x \rightarrow \infty} e^{-x} \sin^2(x^2)$$