§2.2 (part 2): Limits All Around the Plane

1.] Let $f(x) = \dfrac{5x+6}{x-2}$. Evaluate the limits $\lim\limits_{x\to-\infty} f(x)$ and $\lim\limits_{x\to\infty} f(x)$ without using the graph but by evaluating the function directly using a computer algebra system (e.g. Desmos) or a calculator. Fill out the following tables below.

x	-10	-100	-1000	-10000
$f(x)$				

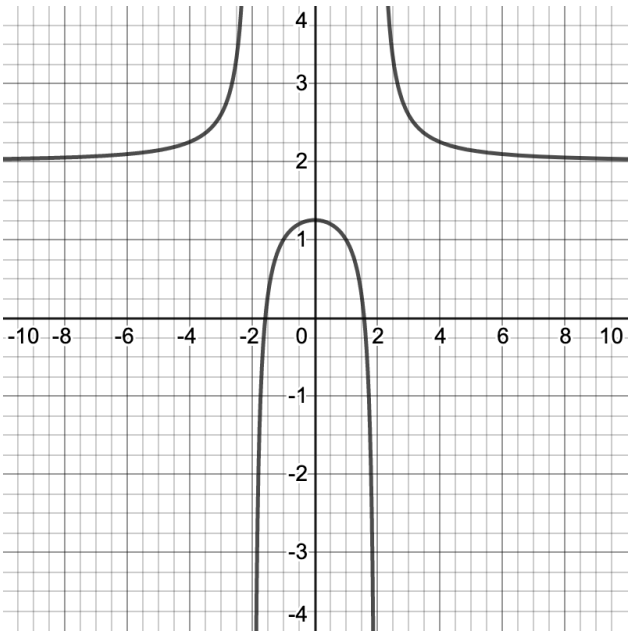
$\lim\limits_{x\to-\infty} \dfrac{5x+6}{x-2} =$

x	10	100	1000	10000
$f(x)$				

$\lim\limits_{x\to\infty} \dfrac{5x+6}{x-2} =$

Deduce whether or not the function has a horizontal asymptote.

2.] The graph of the function $f(x) = \dfrac{2x^2-5}{x^2-4}$ is shown below. Is $f(x)$ algebraic or transcendental? Answer questions below:



a.) Domain:

b.) $\lim\limits_{x\to-2^-} f(x)$

c.) $\lim\limits_{x\to-2^+} f(x)$

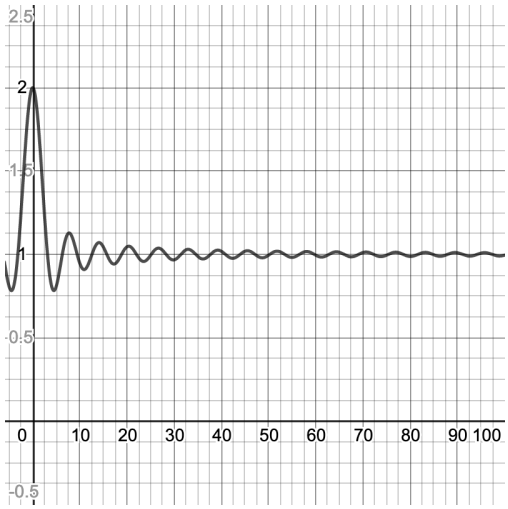
d.) $\lim\limits_{x\to2^-} f(x)$

e.) $\lim\limits_{x\to2^+} f(x)$

f.) $\lim\limits_{x\to-\infty} f(x)$

g.) $\lim\limits_{x\to\infty} f(x)$

3.] Consider the graph of the function $f(x) = 1 + \dfrac{\sin(x)}{x}$ below.



Does this function have a horizontal asymptote? To answer this question, evaluate the following limit:

$$\lim_{x\to\infty} 1 + \frac{\sin(x)}{x}$$

4.] Determine the end behavior of the function $f(x) = x^2 - 2x - 8$.

5.] Determine if the function $f(x) = \sin(x)$ has a horizontal asymptote.