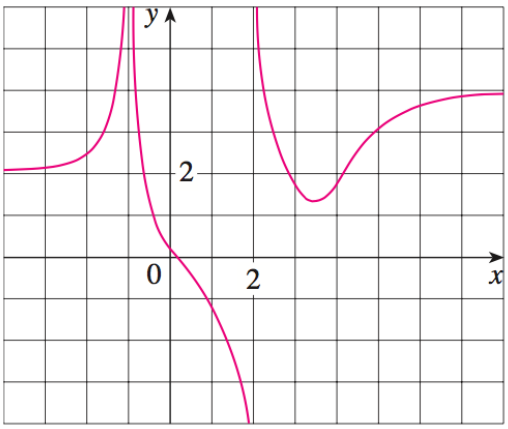
SECTION 2-6 LIMITS AT INFINITY (DAY 1)

1. Consider the function $f(x)$ whose graph is shown below.



(a) Determine the following limits from the graph:

i. $\lim_{x\to 2^-} f(x) =$

ii. $\lim_{x\to 2^+} f(x) =$

iii. $\lim_{x\to -1^-} f(x) =$

iv. $\lim_{x\to -1^+} f(x) =$

v. $\lim_{x\to 2.5} f(x) =$

vi. $\lim_{x\to \infty} f(x) =$

vii. $\lim_{x\to -\infty} f(x) =$

(b) Write the equations of any horizontal and vertical asymptotes.

2. By thinking about the graphs of these functions or using your intuition (what's happening as x gets big?), find the following limits, if they exist.

a) $\lim_{x\to\infty} \dfrac{1}{7x+1}$ b) $\lim_{x\to\infty} \sin x$ c) $\lim_{x\to\infty} 3e^{-x}$

3. Explain: as $x \to \infty$, what happens to $\dfrac{1}{x}$? Why? What happens to $\dfrac{1}{x^n}$ for any positive integer n?

> **How to Determine Limits at Infinity for rational functions:** Divide each term in the the numerator and denominator by the highest power of x in the denominator.

4. Find the limit.

(a) $\lim_{x\to\infty} \dfrac{2x+5}{x-4}$ (highest power is x)

(b) $\lim_{x\to\infty} \dfrac{x+4}{x^2+x-3}$ (highest power is x^2)

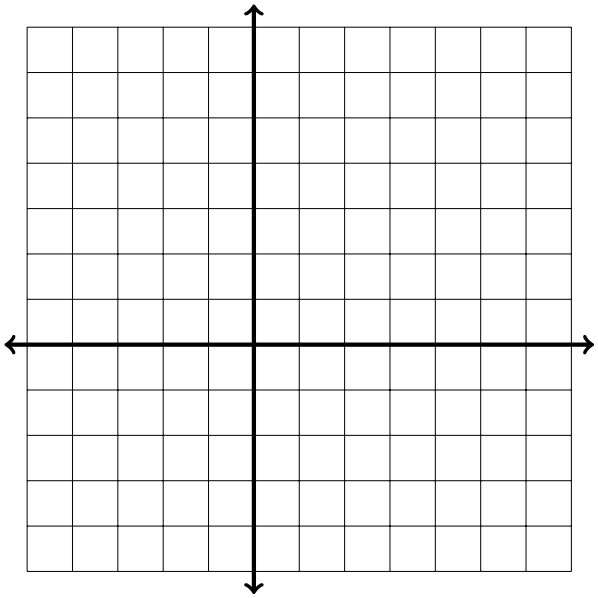
5. Find the following limits.

(a) $\lim_{x\to\infty} \dfrac{2x^2+5}{3x^2+1}$

(b) $\lim_{x\to\infty} \dfrac{2x+5}{3x^2+1}$

(c) $\lim_{x\to\infty} \dfrac{2x^3+5}{3x^2+1}$

6. (a) Sketch a graph of a function $f(x)$ that has the following properties:



i. $f(0) = 3$

ii. $\lim_{x\to 0^-} f(x) = 4$

iii. $\lim_{x\to 0^+} f(x) = 2$

iv. $\lim_{x\to\infty} f(x) = 3$

v. $\lim_{x\to -\infty} f(x) = -\infty$

vi. $\lim_{x\to 4^-} f(x) = -\infty$

vii. $\lim_{x\to 4^+} f(x) = \infty$

(b) List the equation(s) of any horizontal asymptotes _____

(c) List the equation(s) of any vertical asymptotes _____

(d) List any real numbers where f is not continuous _____