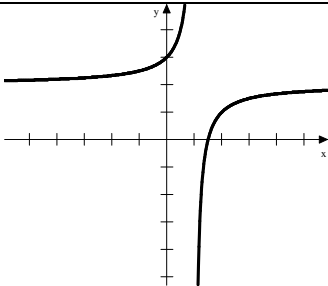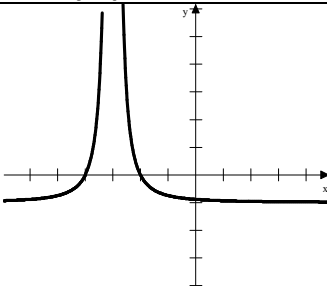**2.4 Practice – Limits to Infinity**

Pre-Calculus

Name: ___**Answer Key**___

For 1-2, use limit notation to represent the horizontal and vertical asymptotes. Then sketch them on the graph.

1.	

Horizontal Asymptote:
$$\lim_{x \to -\infty} f(x) = 2$$
$$\lim_{x \to \infty} f(x) = 2$$

Vertical Asymptote:
$$\lim_{x \to 1^-} f(x) = \infty$$
$$\lim_{x \to 1^+} f(x) = -\infty$$

2.

Horizontal Asymptote:
$$\lim_{x \to -\infty} f(x) = -1$$
$$\lim_{x \to \infty} f(x) = -1$$

Vertical Asymptote:
$$\lim_{x \to -3^-} f(x) = \infty$$
$$\lim_{x \to -3^+} f(x) = \infty$$

For 3-8, use a graphing calculator to find the horizontal asymptotes. Use limit notation to represent both the left and the right side end behavior.

3. $f(x) = \dfrac{2x-4}{x-8}$

$\lim_{x \to -\infty} f(x) = 2$

$\lim_{x \to \infty} f(x) = 2$

4. $f(x) = \dfrac{2.6}{1+e^{-x}} - 2$

$\lim_{x \to -\infty} f(x) = -2$

$\lim_{x \to \infty} f(x) = 0.6$

5. $f(x) = \dfrac{10x-13x^3}{39x^3+89x^2+x}$

$\lim_{x \to -\infty} f(x) = -\dfrac{1}{3}$

$\lim_{x \to \infty} f(x) = -\dfrac{1}{3}$

6. $f(x) = \dfrac{5+x^2}{12-3x^2+9x}$

$\lim_{x \to -\infty} f(x) = -\dfrac{1}{3}$

$\lim_{x \to \infty} f(x) = -\dfrac{1}{3}$

7. $f(x) = \dfrac{6}{1+e^{-x}} + 2$

$\lim_{x \to -\infty} f(x) = 2$

$\lim_{x \to \infty} f(x) = 8$

8. $f(x) = \dfrac{3.5}{1+e^{-x}} + 1$

$\lim_{x \to -\infty} f(x) = 1$

$\lim_{x \to \infty} f(x) = 4.5$

For 9-11, fill in the table and use that information to identify the vertical asymptote. Use limit notation to represent the behavior of the graph at the vertical asymptote.

9. $f(x) = \dfrac{5x^2-4x-1}{10x^2-38x-8}$

x	3	3.9	3.999	4	4.001	4.1	5
f(x)	-1	-14.5	-1499.5	ERROR	1500.5	15.5	2

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

10. $f(x) = \dfrac{3x^2-20x-7}{9x^2+21x+6}$

x	-3	-2.1	-2.001	-2	-1.999	-1.9	-1
f(x)	3.333	30.33	3000.33	ERROR	-2.999	-29.67	-2.667

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

11. $f(x) = \dfrac{x}{1-x}$

x	0	0.5	0.999	1	1.001	1.5	2
f(x)	0	1	999	ERROR	-1001	-3	-2

Choose your own domain values!

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

Your answers in the table may vary.