Name: ANSWER KEY Date: _____

Pre-Calculus: Section 2.6 Practice

1. Show that $f(x)=\frac{-2}{x+4}+3$ is a rational function and state the domain in interval notation.

$= \frac{-2}{x+4} + 3\left(\frac{x+4}{x+4}\right) = \frac{-2+3x+12}{x+4} = \boxed{\frac{3x+10}{x+4}}$ -4

D: $(-\infty,-4)\cup(-4,\infty)$

2. State the domain of each function in interval notation.

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

$(-\infty,-3)\cup(-3,3)\cup(3,\infty)$

b) $f(x)=\frac{x-2}{x^2+3x}$ $x(x+3)$ $0 \quad -3$

$(-\infty,-3)\cup(-3,0)\cup(0,\infty)$

3. Describe the end behavior of each function using proper limit notation.

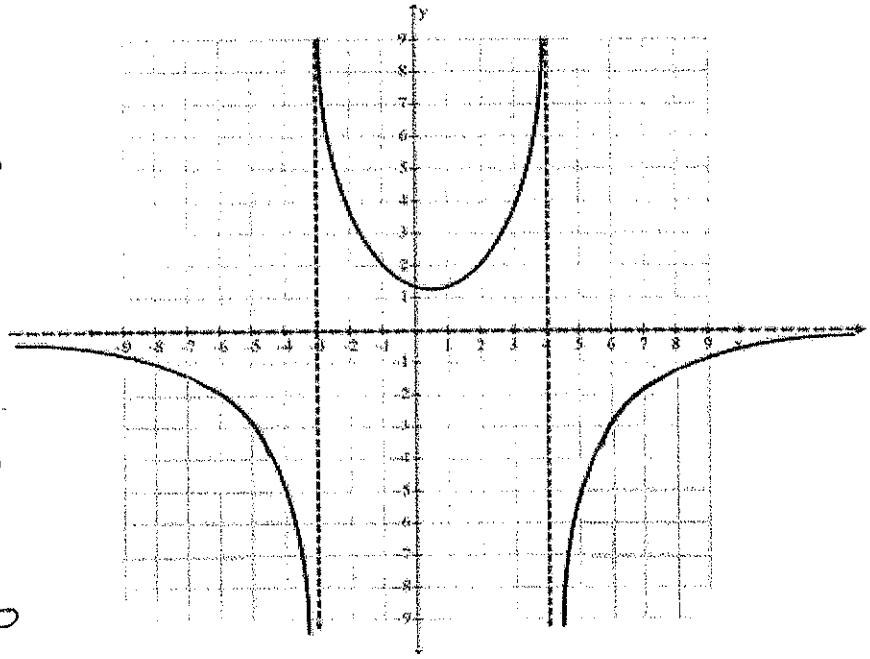
a) $f(x)=\frac{x+1}{x^2-2x}$ HA $y=0$ $n<m$

$\lim_{x\to-\infty} f(x) = 0 \quad \lim_{x\to\infty} f(x) = 0$

b) $f(x)=\frac{1-5x}{x+2}$ $n=m$ HA $y=-5$

$\lim_{x\to-\infty} f(x) = -5 \quad \lim_{x\to\infty} f(x) = -5$

4. Evaluate the following limits.



asymptotic behavior

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

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

$\lim_{x\to4^-} f(x) = \infty$

$\lim_{x\to4^+} f(x) = -\infty$

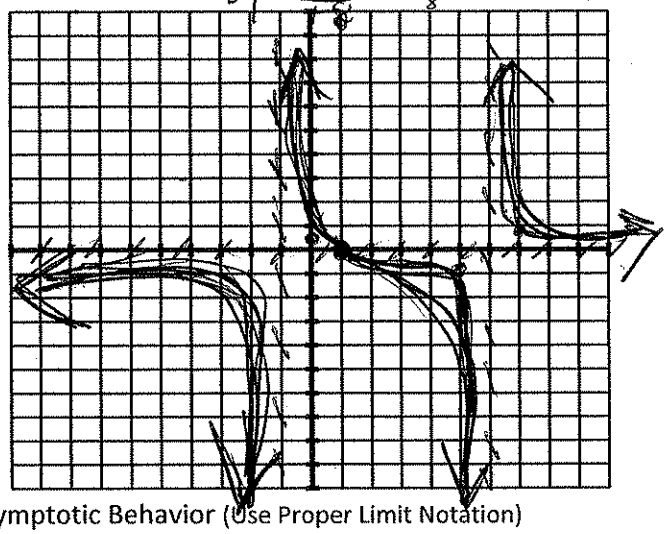
$\lim_{x\to-\infty} f(x) = 0 \qquad \lim_{x\to\infty} f(x) = 0$

end behavior

5. Given: $f(x)=\dfrac{x-1}{x^2-5x-6}$ $\quad (x-6)(x+1)$

Sketch f(x).

x	y
7	$\frac{6}{8}=\frac{3}{4}$
5	$\frac{4}{-6}=-\frac{2}{3}$
-2	$\frac{-3}{8}=-\frac{3}{8}$



Identify the following:

(1) *x*-intercept(s) $(1,0)$

(2) *y*-intercept $\left(0,\frac{1}{6}\right)$

(3) Vertical Asymptote(s) $x=-1,\ x=6$

$n<m$

(4) End Behavior Asymptote $y=0$

(5) End Behavior (Use Proper Limit Notation)

$\lim_{x\to-\infty} f(x) = 0$

$\lim_{x\to\infty} f(x) = 0$

(6) Asymptotic Behavior (Use Proper Limit Notation)

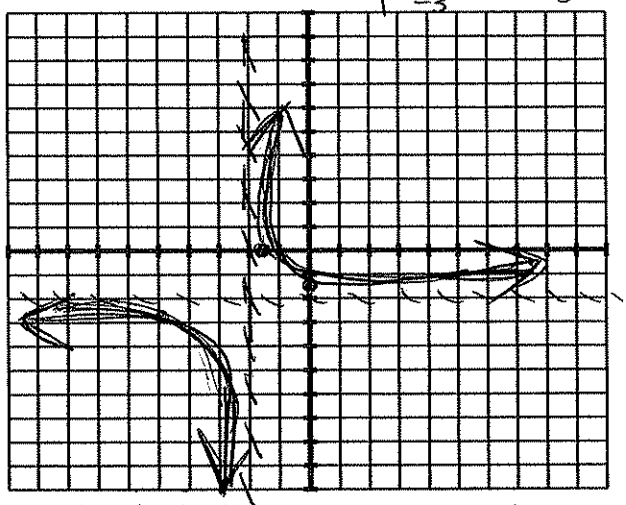
$\lim_{x\to-1^-} f(x) = -\infty$ $\quad \lim_{x\to6^-} f(x) = -\infty$

$\lim_{x\to-1^+} f(x) = \infty$ $\quad \lim_{x\to6^+} f(x) = \infty$

6. Given: $f(x)=\dfrac{-2x-3}{x+2}$

Sketch f(x).

x	y
5	$\frac{-13}{7}$
-5	$\frac{7}{-3}=-2\frac{1}{3}$



Identify the following:

(1) *x*-intercept(s) $\left(-\frac{3}{2},0\right)$

(2) *y*-intercept $\left(0,-\frac{3}{2}\right)$

(3) Vertical Asymptote(s) $x=-2$

$n=m$

(4) End Behavior Asymptote $y=-2$

(5) End Behavior (Use Proper Limit Notation)

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

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

(6) Asymptotic Behavior (Use Proper Limit Notation)

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

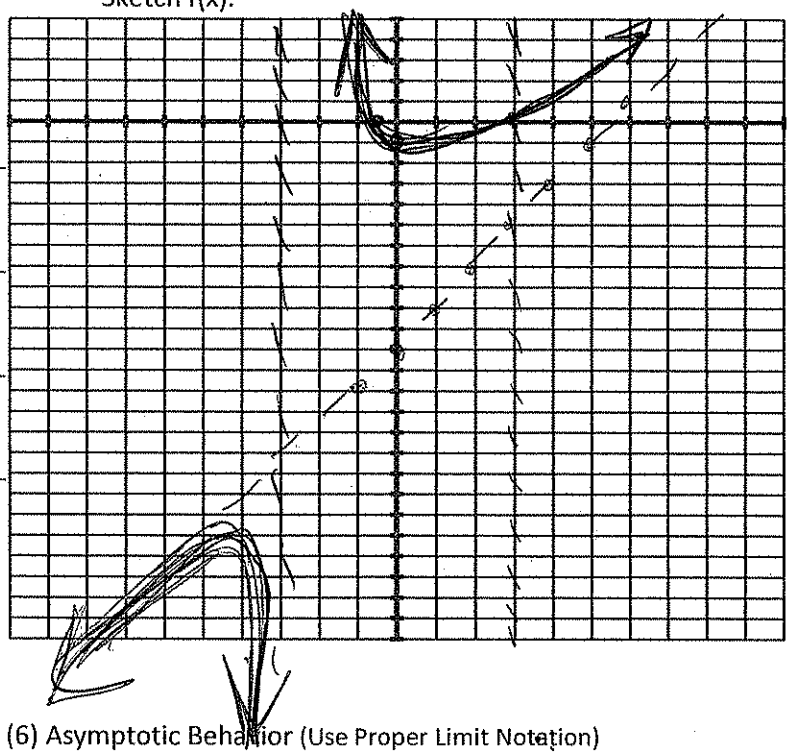
$\lim_{x\to-2^+} f(x) = \infty$

$(2x+1)(x-3)$

x	y
-4	$\frac{49}{-1} = -49$

7. Given: $f(x) = \dfrac{2x^2 - 5x - 3}{x+3}$

Sketch f(x).



Identify the following:

(1) *x*-intercept(s) $\left(-\frac{1}{2}, 0\right)(3, 0)$

(2) *y*-intercept $(0, -1)$

(3) Vertical Asymptote(s) $x = -3$

$n > m$

(4) End Behavior Asymptote $y = 2x - 11$

$-3 \mid 2 \quad -5 \quad -3$

$\quad\quad\downarrow \quad -6$

$\quad\quad 2 \quad -11$

(5) End Behavior (Use Proper Limit Notation)

$\lim\limits_{x \to -\infty} f(x) = -\infty$ (or) $2x - 11$

$\lim\limits_{x \to \infty} f(x) = \infty$ (or) $2x - 11$

(6) Asymptotic Behavior (Use Proper Limit Notation)

$\lim\limits_{x \to -3^-} f(x) = -\infty$

$\lim\limits_{x \to -3^+} f(x) = \infty$

8. Describe how each function can be obtained by transforming the function $f(x) = \dfrac{1}{x}$.

a) $f(x) = \dfrac{3x-3}{x-5}$

$5 \mid 3 \quad -3$

$\quad\quad\downarrow \quad 15$

$\quad 3 \quad 12$

$3 + \frac{12}{x-5}$

R 5
VST 12
Up 3

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

$-3 \mid -4 \quad 3$

$\quad\quad\downarrow \quad 12$

$\quad -4 \quad 15$

$-4 + \frac{15}{x+3}$

L 3
VST 15
Down 4

9. Find a rational function of the form $f(x)=\dfrac{ax+b}{cx+d}$ that satisfies the given conditions:

EBA: $y=2$ VA: $x=3$

$$f(x)=\frac{2x+?}{x-3}$$

10. Find a rational function that has an end behavior asymptote of $y=x^2+2x$ and a vertical asymptote at $x=2$.

$$f(x)=\frac{x^3-4x+?}{x-2}$$

work backwards:

2 | 1 0 −4 ? 3rd

↓ 2 4 0

1 2 0 ? 2nd

↑ doesn't matter

mult:

$(x-2)(x^2+2x)$

$x^3-2x^2+2x^2-4x$