Key

Math 4

Name _____

Date _____

U3 L3 I2 Part 1 Homework

I can identify important characteristics (asymptotes, holes, intercepts, and end behavior) of rational functions

1. Find the following information for the below functions:

a. $f(x)=\dfrac{x^2+11x+18}{x+1} = \dfrac{(x+9)(x+2)}{x+1}$

Oblique:

$-1 \mid 1 \quad 11 \quad 18$

$\quad\quad -1 \quad -10$

$1 \quad 10 \mid 8$

Domain: $\{x : x \neq -1\}$ *x-intercept(s):* $(-9,0)$ & $(-2,0)$ *y-intercept:* $(0,18)$

horizontal asymptote(s): None *vertical asymptote(s):* $x=-1$

oblique asymptote: $y=x+10$ *hole:* None

---

b. $g(x)=\dfrac{x-3}{x^2-2x-3} = \dfrac{x-3}{(x-3)(x+1)} = \dfrac{1}{x+1}$

Domain: $\{x : x \neq 3, x \neq -1\}$ *x-intercept(s):* None *y-intercept:* $(0,1)$

horizontal asymptote(s): $y=0$ *vertical asymptote(s):* $x=-1$

oblique asymptote: None *hole:* $\left(3, \frac{1}{4}\right)$ → $g(3) = \frac{1}{3+1} = \frac{1}{4}$

---

c. $g(x)=\dfrac{2x^2-3x-9}{x^2-9} = \dfrac{(2x+3)(x-3)}{(x+3)(x-3)} = \dfrac{2x+3}{x+3}$

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

horizontal asymptote(s): $y=2$ *vertical asymptote(s):* $x=-3$

oblique asymptote: None *hole:* $\left(3, \frac{3}{2}\right)$

$\dfrac{2(3)+3}{3+3} = \dfrac{9}{6} = \dfrac{3}{2}$

2. Find the following information for the below functions:

a. $g(x)=\dfrac{3x^2-14x+8}{9x^2-4} = \dfrac{(3x-2)(x-4)}{(3x+2)(3x-2)} = \dfrac{x-4}{3x+2}$

Domain: $\{x: x \neq \pm\frac{2}{3}\}$ *x-intercept(s):* $(4,0)$ *y-intercept:* $(0,-2)$

horizontal asymptote(s): $y=\frac{3}{9}=\boxed{\frac{1}{3}}$ *vertical asymptote(s):* $x=-\frac{2}{3}$

oblique asymptote: None *hole:* $(\frac{2}{3}, -\frac{5}{6})$

$\frac{\frac{2}{3}-4}{3(\frac{2}{3})+2} = \frac{-\frac{10}{3}}{4} = -\frac{10}{12} = -\frac{5}{6}$; $4=\frac{12}{3}$

---

b. $g(x)=\dfrac{x+12}{2x^2-25x+12} = \dfrac{x+12}{(2x-1)(x-12)}$

Domain: $\{x: x \neq \frac{1}{2}, x \neq 12\}$ *x-intercept(s):* $(-12,0)$ *y-intercept:* $(0,1)$

horizontal asymptote(s): $y=0$ *vertical asymptote(s):* $x=\frac{1}{2}$ & $x=12$

oblique asymptote: None *hole:* None

---

c. $g(x)=\dfrac{2x^2+3x+1}{2x-1} = \dfrac{(2x+1)(x+1)}{2x-1}$

Domain: $\{x: x \neq \frac{1}{2}\}$ *x-intercept(s):* $(-\frac{1}{2},0)$ & $(-1,0)$ *y-intercept:* $(0,1)$

horizontal asymptote(s): None *vertical asymptote(s):* $x=\frac{1}{2}$

oblique asymptote: $y=x+2$ *hole:* None

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

$\frac{1}{2}$ | 2 3 1
1 2
2 4 | 3
1 2 | 3

or

$$2x-1 \overline{)\,2x^2+3x+1\,}\quad x+2$$
$$-(2x^2-x)$$
$$4x+1$$
$$-(4x-2)$$
$$3$$