Name: Period: Date:

Practice Worksheet: Rational Functions

1] The graph of a rational function has a(n) ________________ __________________ at $y = 0$ if the degree of the numerator is __________ ____________ the degree of the denominator.

2] The horizontal asymptote of a rational function is the ratio of leading coefficients when the degree of the numerator is ___________ ____________ the degree of the denominator.

3] If the degree of the numerator is ___________ _____________ than the degree of the denominator, the rational function has a(n) ________________ _________________.

4] You must use synthetic or long _______________ to find the equation of an oblique asymptote.

5] When you cancel a common factor out of the numerator and denominator of a rational function, it forms a ____________ in the graph at that point. To find the coordinates of that point, set the canceled factor equal to ___________ and solve for x. Then _____________ to find y.

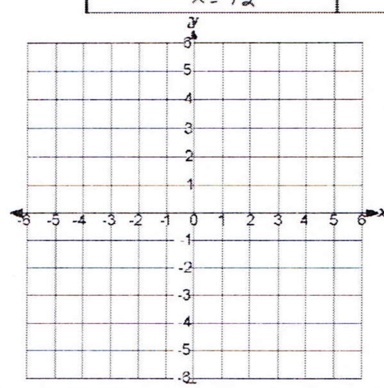
$f(x) = \frac{x^2-8x+7}{x-1}$ $\frac{(x-1)(x-7)}{x-1} = x-7$ $x-1=0$ $x=1$ $y=1-7=-6$	$g(x) = \frac{x^2-15x+56}{x-3}$ $g(x) = \frac{(x-7)(x-8)}{x-3}$ $x-7=0$ $x-8=0$ $x=7$ $x=8$
$h(x) = \frac{x^2+2x-15}{2x^2-7x+3}$ $\frac{(x+5)(x-3)}{(2x-1)(x-3)}$ $2x-1=0$ $x=1/2$	$j(x) = \frac{2x^2-5x+5}{x-2}$ $2 \,\vert\, 2 \;\; -5 \;\; 5$ $\;\;\;\;\; 4 \;\; -2$ $2 \;\; -1 \;\; 3:R$ $y=2x-1$

6] Match the work shown for each process.

______a) Finding an oblique asymptote ______ b) Finding a zero

______ c) Finding a vertical asymptote ______ d) Finding a hole

7] $f(x) = \frac{x^2-25}{x^2-4x-5} = \frac{(x+5)(x-5)}{(x-5)(x+1)} = \frac{x+5}{x+1}$



Coordinates of hole:

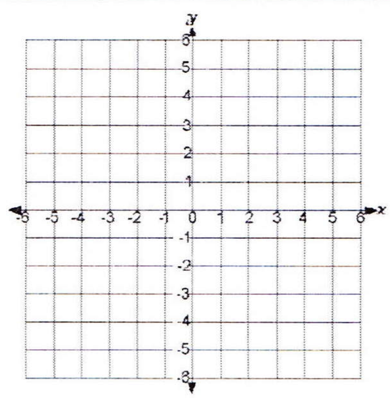
Equation of vertical asymptote:

Zero(s): y-intercept:

Equation of horizontal OR oblique asymptote:

Domain: Range:

8] $f(x) = \frac{x^2+x-6}{x^2-4}$



Coordinates of hole:

Equation of vertical asymptote:

Zero(s): y-intercept:

Equation of horizontal OR oblique asymptote:

Domain: Range:

9] $f(x) = \frac{x^2+2x-3}{x-1}$

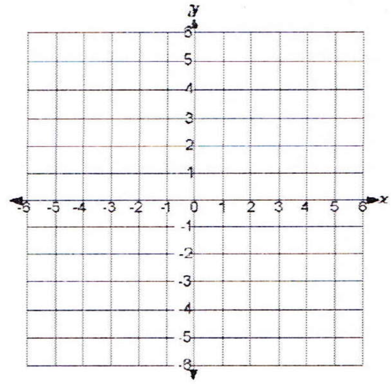
Coordinates of hole:

Equation of vertical asymptote:

Zero(s): y-intercept:

Equation of horizontal <u>OR</u> oblique asymptote:

Domain: Range:



10] $f(x) = \frac{x-3}{x^2+x-12}$

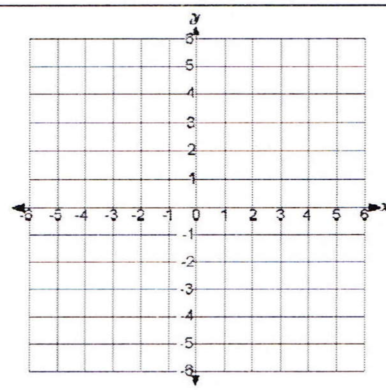
Coordinates of hole:

Equation of vertical asymptote:

Zero(s): y-intercept:

Equation of horizontal <u>OR</u> oblique asymptote:

Domain: Range:



11] $f(x) = \frac{x^2+2x-15}{x+3}$

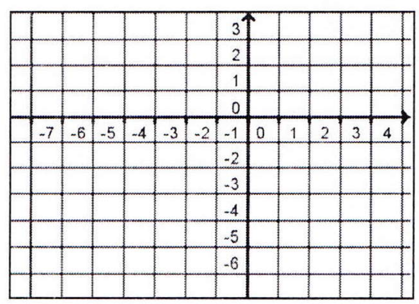
Coordinates of hole:

Equation of vertical asymptote:

Zero(s): y-intercept:

Equation of horizontal <u>OR</u> oblique asymptote:

Domain: Range:



12] $f(x) = \frac{(x+1)(x^2+2x+1)}{x^2-1}$

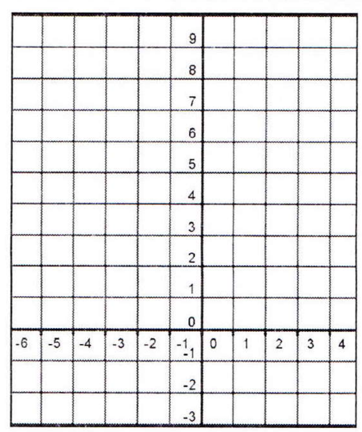
Coordinates of hole:

Equation of vertical asymptote:

Zero(s): y-intercept:

Equation of horizontal <u>OR</u> oblique asymptote:

Domain: Range:



Hint: The point (3, 8) is on the graph and it is a rel. minimum.

KEY

Name: Period: Date:

Practice Worksheet: Rational Functions

1] The graph of a rational function has a(n) horizontal asymptote at $y = 0$ if the degree of the numerator is less than the degree of the denominator.

2] The horizontal asymptote of a rational function is the ratio of leading coefficients when the degree of the numerator is equals the degree of the denominator.

3] If the degree of the numerator is more than the degree of the denominator, the rational function has a(n) horizontal or oblique asymptote. (can't have both)

4] You must use synthetic or long division to find the equation of an oblique asymptote.

5] When you cancel a common factor out of the numerator and denominator of a rational function, it forms a hole in the graph at that point. To find the coordinates of that point, set the canceled factor equal to zero and solve for x. Then ______________ to find y.

substitute result back into the simplified form

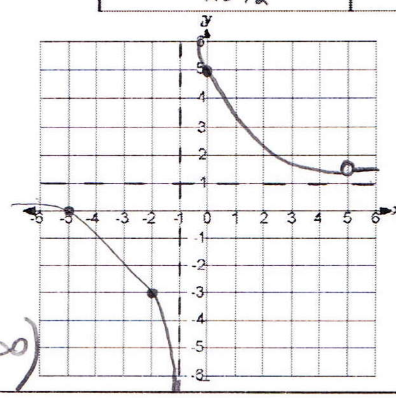
$f(x) = \frac{x^2-8x+7}{x-1}$ $\frac{(x-1)(x-7)}{x-1} = x-7$ $x-1=0$, $x=1$ $y = 1-7 = -6$	$g(x) = \frac{x^2-15x+56}{x-3}$ $g(x) = \frac{(x-7)(x-8)}{x-3}$ $x-7=0$ $x-8=0$ $x=7$ $x=8$
$h(x) = \frac{x^2+2x-15}{2x^2-7x+3}$ $\frac{(x+5)(x-3)}{(2x-1)(x-3)}$ $2x-1=0$ $x=1/2$	$j(x) = \frac{2x^2-5x+5}{x-2}$ $2 \mid 2 \ -5 \ 5$ $4 \ -2$ $2 \ -1 \ 3:R$ $y=2x-1$

6] Match the work shown for each process.

j(x) a) Finding an oblique asymptote g(x) b) Finding a zero

h(x) c) Finding a vertical asymptote f(x) d) Finding a hole

7] $f(x) = \frac{x^2-25}{x^2-4x-5} = \frac{(x+5)(x-5)}{(x-5)(x+1)} = \frac{x+5}{x+1}$



Coordinates of hole: $(5, \frac{5}{3})$

Equation of vertical asymptote: $x = -1$

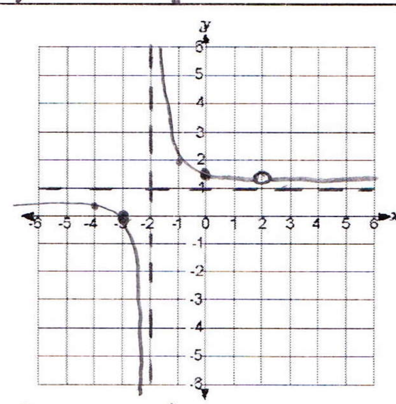
Zero(s): $(-5, 0)$ y-intercept: $(0, 5)$

Equation of horizontal OR oblique asymptote: $y = 1$

Domain: $(-\infty, -1) \cup (-1, 5) \cup (5, \infty)$

Range: $(-\infty, 1) \cup (1, \frac{5}{3}) \cup (\frac{5}{3}, \infty)$

8] $f(x) = \frac{x^2+x-6}{x^2-4} = \frac{(x+3)(x-2)}{(x+2)(x-2)} = \frac{x+3}{x+2}$



Coordinates of hole: $(2, \frac{5}{4})$

Equation of vertical asymptote: $x = -2$

Zero(s): $(-3, 0)$ y-intercept: $(0, \frac{3}{2})$

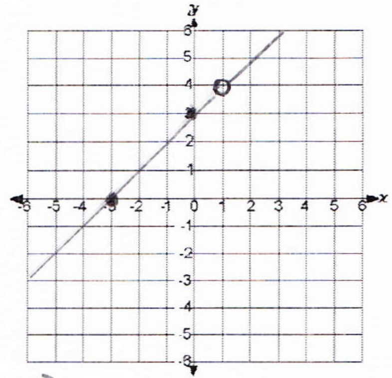
Equation of horizontal OR oblique asymptote: $y = 1$

Domain: $(-\infty, -2) \cup (-2, 2) \cup (2, \infty)$

Range: $(-\infty, 1) \cup (1, \frac{5}{4}) \cup (\frac{5}{4}, \infty)$

KEY

* 9] $f(x) = \frac{x^2+2x-3}{x-1} = \frac{(x+3)\cancel{(x-1)}}{\cancel{x-1}} = \frac{x+3}{1}$



Coordinates of hole: $(1, 4)$

Equation of vertical asymptote: none

Zero(s): $(-3, 0)$ y-intercept: $(0, 3)$

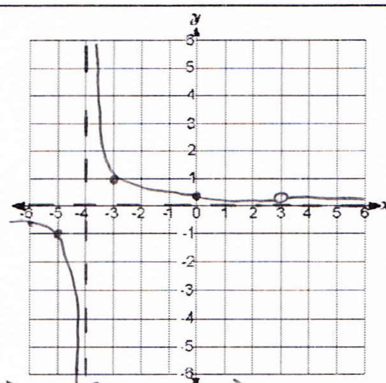
USE synthetic division

Equation of horizontal OR oblique asymptote: $y = x + 3$

Domain: $(-\infty, 1) \cup (1, \infty)$

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

10] $f(x) = \frac{x-3}{x^2+x-12} = \frac{\cancel{x-3}}{(x+4)\cancel{(x-3)}} = \frac{1}{x+4}$



Coordinates of hole: $(3, \frac{1}{7})$

Equation of vertical asymptote: $x = -4$

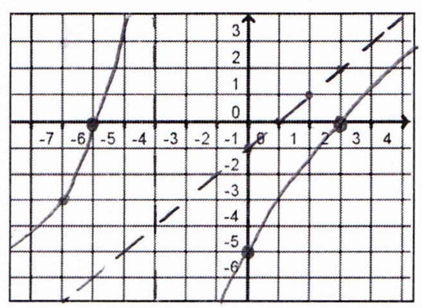
Zero(s): none y-intercept: $(0, \frac{1}{4})$

Equation of horizontal OR oblique asymptote: $y = 0$

Domain: $(-\infty, -4) \cup (-4, 3) \cup (3, \infty)$

Range: $(-\infty, 0) \cup (0, \frac{1}{7}) \cup (\frac{1}{7}, \infty)$

11] $f(x) = \frac{x^2+2x-15}{x+3} = \frac{(x+5)(x-3)}{(x+3)}$



Coordinates of hole: none

Equation of vertical asymptote: $x = -3$

Zero(s): $(-5, 0)$ $(3, 0)$ y-intercept: $(0, -5)$

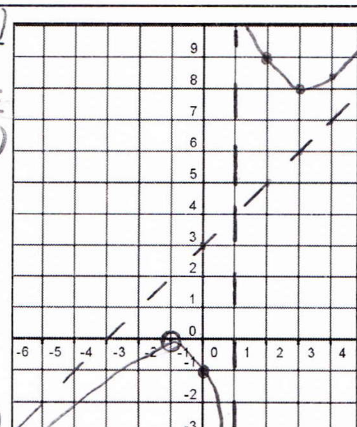
USE synthetic division

Equation of horizontal OR oblique asymptote: $y = x - 1$

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

Range: $(-\infty, \infty)$

12] $f(x) = \frac{(x+1)(x^2+2x+1)}{x^2-1} = \frac{\cancel{(x+1)}(x+1)(x+1)}{\cancel{(x+1)}(x-1)} = \frac{(x+1)(x+1)}{x-1}$



Hint: The point (3, 8) is on the graph and it is a rel. minimum.

Coordinates of hole: $(-1, 0)$ graph will BOUNCE at the hole $(-1, 0)$

Equation of vertical asymptote: $x = 1$

Zero(s): $(-1, 0)$ multiplicity of 2 y-intercept: $(0, -1)$

USE synthetic division

Equation of horizontal OR oblique asymptote: $y = x + 3$

Domain: $(-\infty, -1) \cup (-1, 1) \cup (1, \infty)$

Range: $(-\infty, 0) \cup [8, \infty)$