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1

$$\frac{x^2+6}{x^2+1} - \frac{x^2+5}{x^2-6} = \frac{x^2+6}{x^2+1}$$

Den $\neq 0$ $\frac{x^2+5}{x^2-6} \neq 0$ $x \neq 0$ Restriction

$$\frac{x^2+6}{x^2+1} = \frac{x^2+5}{x^2-6} \text{ for } x \neq 0$$

5 A

$$\frac{7x^2+5x}{x^2+1} - \frac{5x}{x^2-6}$$

$x \neq 0$
 $\frac{x^2+1}{(x^2+1)(x^2-6)}$
 They do not
 cancel

$$\frac{(7x^2+5x)(x^2-6)}{(x^2+1)(x^2-6)} - \frac{5x(x^2+1)}{(x^2+1)(x^2-6)}$$

→

$$\frac{\quad}{(x^2+1)(x^2-6)}$$

Simplify
 From
 here

$$\frac{x^2+6}{x^2-6}$$

Does not
 cancel
 because
 they
 are
 lower

56

$$\frac{6}{x-1} - \frac{5}{x} \quad LCM = x(x-1)$$

$$\frac{6x}{x(x-1)} - \frac{5(x-1)}{x(x-1)}$$

$$\frac{6x - 5x + 5}{x(x-1)}$$

$$\frac{x+5}{x(x-1)} \quad \text{or} \quad \frac{15(x+1)}{x(x-1)}$$

$$\frac{5x + 25}{x(x-1)}$$

$$\frac{15x}{x-1}$$

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$$\frac{5x}{6} \quad \text{or} \quad \frac{5x}{6} \times \frac{2}{2} = \frac{10x}{12}$$

$$\frac{5x}{6} \times \frac{1}{1} = \frac{5x}{6}$$

$$\frac{5x}{6} \times \frac{2}{2} = \frac{10x}{12}$$

$$\frac{10x}{12}$$

identity

$$\frac{5x}{6} \times \frac{2}{2} = \frac{10x}{12}$$

1
2B

$$x \cdot \frac{x-c}{-c}$$

$$\frac{x}{-1} \cdot \frac{x-c}{x-c}$$

(3)

$$\frac{-cx}{x-c}$$

$x-c \neq 0$

$$x \neq c$$

2A

Factor

$$\frac{x^2 - 8x + 9}{x^2 + 2x + 1}$$

$$\frac{(x-9)(x+1)}{(x+1)(x+1)}$$

$$\frac{x-9}{x+1}$$

$$x+1 \neq 0$$

for

$$x \neq -1$$

2C

$$\frac{9-x}{x^2-81}$$

$$\frac{-1(-9+x)}{(x-9)(x+9)}$$

$$\frac{-1(x-9)}{(x-9)(x+9)}$$

$$x \neq 9 \quad x \neq -9$$

$$\frac{-1}{x+9}$$

$$\text{for } x+9 \neq 0$$

$$x \neq -9$$

4

$$\frac{y \text{ int}}{x=0}$$

$$y=0$$

$$\frac{0^2 + 4(0)}{2(0) + 1} = 0$$

$$\frac{x \text{ int}}{y=0}$$

$$\text{Num} = 0$$

$$x^2 + 4x = 0$$

$$x(x+4) = 0$$

$$x=0$$

$$x=-4$$

23

$$y = \frac{x^2 + 4x}{(2x+1)^2}$$

$$\frac{x^2 + 4x}{(2x+1)(2x+1)}$$

$$\frac{x(x+4)}{(2x+1)(2x+1)}$$

$$\frac{x/y}{0/0}$$

Vertical Asymptotes (like log Functions) occur when the denom of the simplified function = 0.

$$\text{VA: } 2x+1=0$$

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

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

HA: Horizontal Asymptotes (like exponential Functions) occur when the degree of the Num is \leq degree of denom

$$\text{Num} = x^2 + 4x \quad \text{Degree 2}$$

$$\text{Den} = 4x^2 + 4x + 1 \quad \text{Degree 2}$$

HA at the quotient of leading terms.

$$\text{HA} = \frac{x^2}{4x^2} = \frac{1}{4}$$

23 is cancelled on page 5

(2W)

$$\frac{x^3 + 125}{x + 5} \quad \text{Factor}$$

(7)

$$\frac{(x+5)(x^2 - 5x + 25)}{(x+5)} \quad x \neq -5$$

$$\frac{x^3 + 125}{x + 5} = x^2 - 5x + 25 \quad \text{for } x \neq -5$$

(3/2)

$$\sqrt{x+3} - \sqrt{\frac{6}{x+3}} = 0 \quad x \neq -3$$

$$\sqrt{x+3} = \sqrt{\frac{6}{x+3}}$$

$$x+3 = \frac{36}{x+3}$$

$$(x+3)(x+3) = 36$$

$$x^2 + 6x + 9 - 36 = 0$$

$$x^2 + 6x - 27 = 0$$

$$(x+9)(x-3) = 0$$

$$x = -9 \quad x = 3$$

Check $x=3$

$$\sqrt{6} - \frac{6}{\sqrt{6}} = 0$$

$$\sqrt{6} - \sqrt{6} = 0$$

$$0 = 0$$

True

Check $x=-9$

$$\sqrt{6} - \frac{6}{\sqrt{6}} = 0$$

$$1\sqrt{6} - \frac{6}{1\sqrt{6}} = 0$$

$$1\sqrt{6} - \frac{\sqrt{6} \cdot 6}{1 \cdot 1} = 0$$

$$1\sqrt{6} - \frac{1\sqrt{6}}{1} = 0$$

$$\text{False } 1\sqrt{6} + 1\sqrt{6} = 0$$

6

3/13

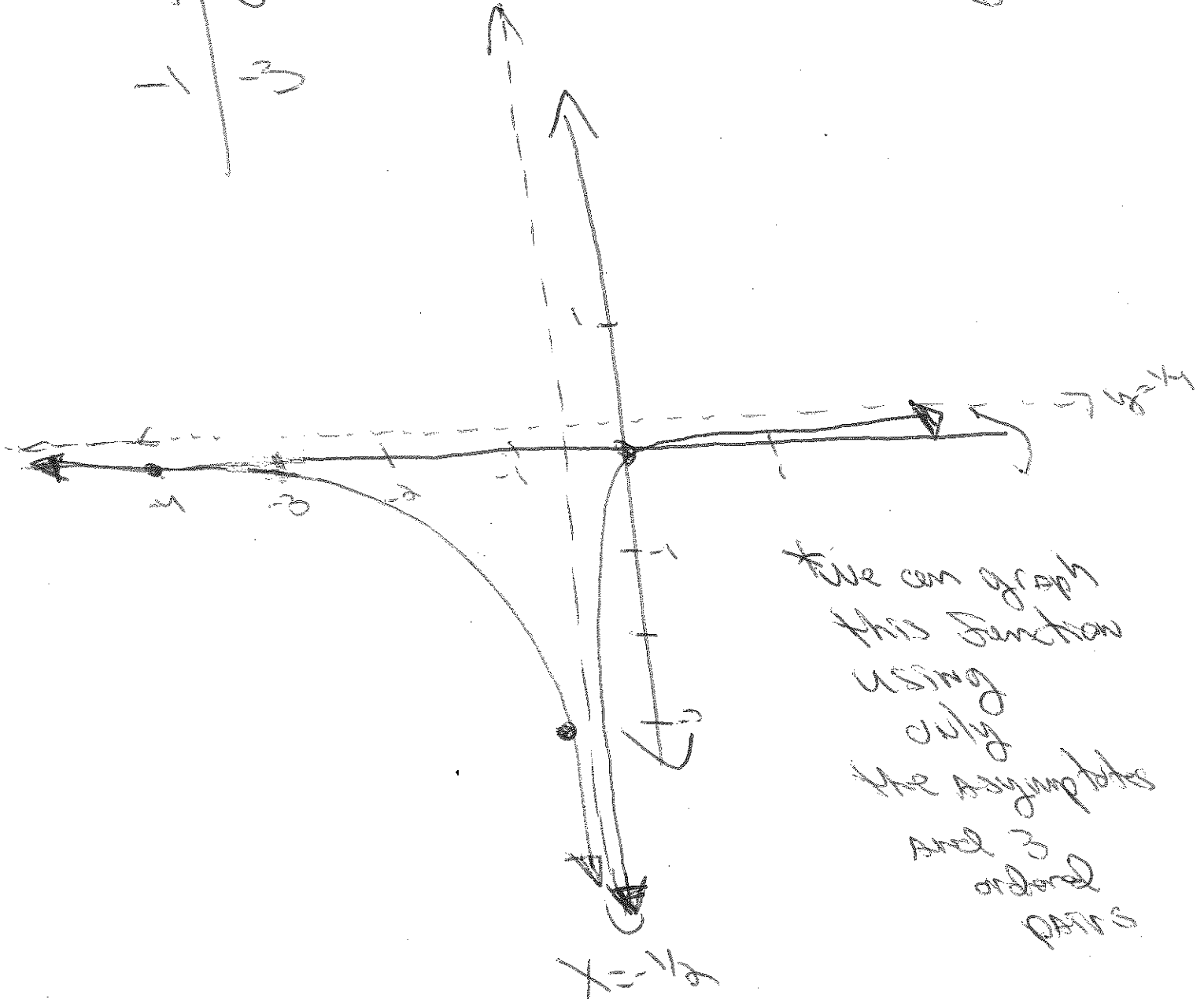
$$x = -1 \quad y = \frac{(-1)^2 + 4(-1)}{(2(-1) + 1)^2} = \frac{1 - 4}{1} = -3$$

$$y = \frac{x^2 + 4x}{(2x + 1)^2}$$

Need an
ordered pair
to the left
of $x = -1/2$
 $x = -1$
 $y =$

x	y
0	0
-3	0
-1	-3

VA of $x = -1/2$
HA of $y = 1/4$



We can graph
this function
using
only
the asymptotes
and 3
ordered
pairs

2k

$$\log_3 2x^2 = 3 \log_3 5$$



$$\log_3 2x^2 = \log_3 125$$

$$\frac{2x^2}{3} = \frac{125}{3}$$

$$x^2 = 62.5$$

$$x = \sqrt{62.5}$$

$$x = 7.906$$

2k

9

$$x^2 = \frac{125}{9}$$

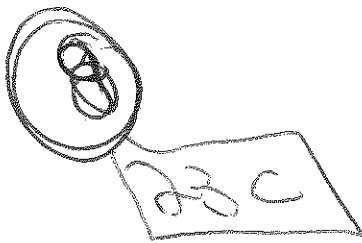
$$x = \sqrt{\frac{125}{9}}$$

$$x = \frac{\sqrt{125}}{3}$$

$$x = \frac{5\sqrt{5}}{3}$$

$$x = \frac{5\sqrt{5}}{3}$$

$$x = \frac{5\sqrt{5}}{3}$$



$$y = \frac{2x - 1}{2x^2 + 7x - 15}$$

We factor the den. and look for possible VA.

$$\begin{aligned} 2x^2 + 7x - 15 \\ 2x^2 + 10x - 3x - 15 \\ 2x(x+5) - 3(x+5) \\ (2x-3)(x+5) \end{aligned}$$

$$\begin{aligned} P &= -30 \\ S &= 7 \\ 10, -3 \end{aligned}$$

VA:

$$\begin{aligned} 2x - 3 &= 0 \\ x &= 3/2 \end{aligned}$$

$$\begin{aligned} x + 5 &= 0 \\ x &= -5 \end{aligned}$$

Note:
Den are excluded values

HA: Degree of Num < Degree of Denom

HA at $y = 0$ in this case

X int

$$\begin{aligned} 2x - 1 &= 0 \\ x &= 1/2 \end{aligned}$$

Y int $(0, 1/15)$

23c

23d

$$y = \frac{2x-1}{2x^2+3x-15}$$

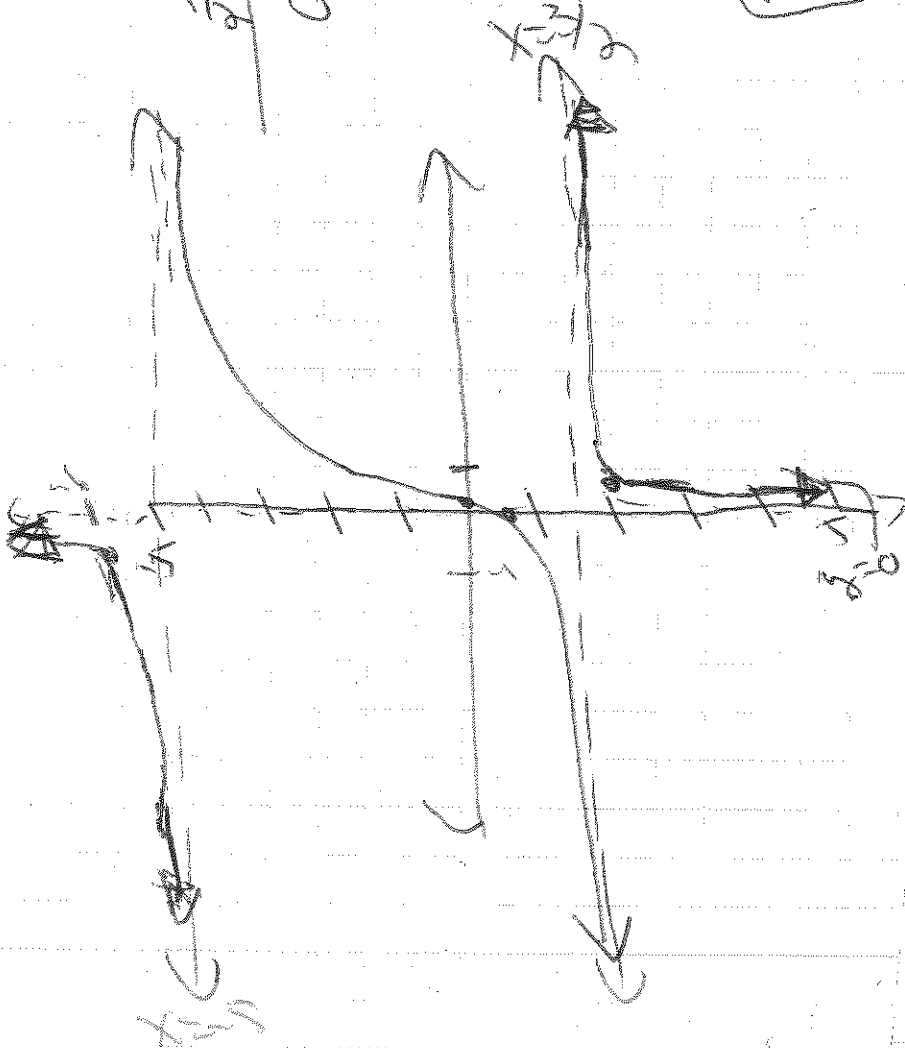
VA $x = 3/2$

HA $x = -5$

HA $y = 0$

x-axis

x	y
0	1/15
1/2	0



You need
ordered pairs
left & right
of the two
VA to
graph
the function

$x = 2$
 $y = 3/5$

Can draw
the graph to
the right of
 $x = 3/2$

HA of $y = 0$

$x = -6$
 $y = 13/15$

Can draw
the graph to
the left of
 $x = -5$

Between the two VA
Get more x-values
and you will
see the graph
opens
up

You actually were not
asked to graph
the VA, HA, etc

Even

$$F(-x) = F(x)$$

F is symmetric over the y -axis

Odd

$$F(-x) = -1 \cdot F(x)$$

F is symmetric about the origin (Double reflection)

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$$f(x) = 2x^5 - x$$

$$f(-x) = 2(-x)^5 - (-x)$$

$$= -2x^5 + x$$

$$f(x) \neq f(-x) \quad \text{Not even}$$

$$-1 \cdot f(x) = -2x^5 + x$$

$$f(-x) = -1 \cdot f(x) \quad f(x) \text{ is odd.}$$

* Note that all of the exponents in $f(x)$ are odd.

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$$g(x) = 10x^6 + 20x^2 + 3$$

$$g(-x) = 10(-x)^6 + 20(-x)^2 + 3$$

$$= 10x^6 + 20x^2 + 3$$

$$g(-x) = g(x) \quad \text{and } g(x) \text{ is even}$$

* Note that all of the exponents in $g(x)$ are even. Constants have even exponents $3 = 3x^0$

(75)

Simplify

$$\frac{2}{\sqrt[3]{x^2}}$$

$$\frac{2}{x^{2/3}}$$

$$\cdot \frac{x^{1/3}}{x^{1/3}}$$

$$= \frac{2x^{1/3}}{x}$$

$$= \frac{2\sqrt[3]{x}}{x}$$

(76)

Rationalize the Denominator

(75)

$$\frac{2y}{\sqrt[3]{x^2}}$$

$$\frac{2y}{x^{2/3}} \cdot \frac{x^{1/3}}{x^{1/3}} = \frac{2yx^{1/3}}{x}$$

$$\frac{2y\sqrt[3]{x}}{x}$$



70

$$9\sqrt{x} - 27x^{3/2}$$

$$9x^{1/2} - 27x^{3/2}$$

$$9x^{1/2}(1 - 3x)$$

$$9\sqrt{x}(1 - 3x)$$

$$\frac{x^{3/2}}{x^{1/2}} = x^{3/2 - 1/2} = x$$

- 4 a. ~~factor~~
- b. ~~factor~~

p = 8
s = 9
t = 1

$$c \text{ cross mult } \frac{1}{x-1} - \frac{x-1}{x-1}$$

$$d \quad \frac{1}{x} + x = 4$$

$x \neq 0$
 mult by LCD
 mult by x
 and solve

$$e) \text{ mult by } \sqrt{x-1} \text{ and solve } - x \neq 1$$

$4x$

$$\frac{1}{x-5} - \frac{1}{x-9}$$

③

$$\frac{1}{x-5} - \frac{1}{x-9}$$

$$\frac{16-x}{16x}$$

④

$$\frac{1}{x-5} - \frac{1}{x-9}$$

$$\frac{16x}{16x} - \frac{16}{16x}$$

⑤

$$\frac{1}{x-5} - \frac{1}{x-9}$$

$$\frac{16x}{16x} - \frac{16}{16x}$$

①

$$\frac{1}{x-5} - \frac{1}{x-9}$$

$$\frac{4-x}{4x}$$

12

LCD = 4x

②

$$\frac{1}{x-5} - \frac{1}{x-9}$$

$$\frac{16}{16x} - \frac{16}{16x}$$

③

$$\frac{1}{x-5} - \frac{1}{x-9}$$

$$\frac{16x}{16x} - \frac{16}{16x}$$

④

$$\frac{1}{x-5} - \frac{1}{x-9}$$

$$\frac{16x}{16x} - \frac{16}{16x}$$

Adding/Subtracting

Rational Expressions

- you need a LCD