8.2 Rational Fncs & Their Graphs

Obj: 1. Identify & evaluate rational fncs.
2. Graph, find domain, identify asymptotes, identify holes in the graph.

Rational Fnc: quotient of 2 polynomials

May 15-11:13 AM

Find the domain: $g(x) = \frac{x^2-7x+12}{x^2+9x+20}$

D: $x^2+9x+20 \neq 0$

$(x+4)(x+5) \neq 0$

$x+4 \neq 0 \quad x+5 \neq 0$

$-4 \quad -4 \quad -5 \quad -5$

$x \neq -4 \quad x \neq -5$ domain restriction

$(-\infty, -5) \cup (-5, -4) \cup (-4, \infty)$

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Find the domain:

$$j(x) = \frac{3x^2+x-2}{x^2+2x-3}$$

D: $x^2+2x-3 \neq 0$

$(x-1)(x+3) \neq 0$

$x-1 \neq 0 \quad x+3 \neq 0$

$x \neq 1 \quad x \neq -3$

vertical asymptotes: $x=1$ $x=-3$

$(-\infty,-3) \cup (-3,1) \cup (1,\infty)$

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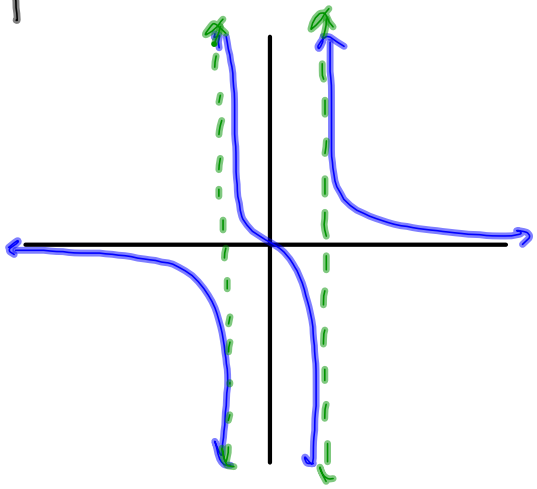
Identify vertical asymptotes:

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

VA: $x^2-1=0$

$x^2=1$

$x=\pm 1$



D: $x \neq \pm 1$

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

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Identify VA : $r(x) = \frac{x}{x^2+5x+6}$

VA : $x^2+5x+6 = 0$

$(x+3)(x+2) = 0$

$x = -3 \quad x = -2$

D: $(-\infty, -3) \cup (-3, -2) \cup (-2, \infty)$

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Horizontal Asymptotes

$R(x) = \frac{P}{Q}$

If: $\deg P < \deg Q$, HA @ $y = 0$

$\deg P = \deg Q$, HA @ $y = \frac{a}{b}$

(a, b are leading coefficients)

$\deg P > \deg Q$, no HA

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$R(x) = \frac{x^1}{x^2-2x-3}$ deg 1 / deg 2 Find VA & HA.

VA: $x^2-2x-3=0$

$(x-3)(x+1)=0$

$x-3=0$ $x+1=0$

$x=3$ $x=-1$

HA: $y=0$

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Find VA & HA $R(x) = \frac{2x^2-2x+1}{1x^2-x-12}$ deg 2 / deg 2

VA: $x^2-x-12=0$

$(x-4)(x+3)=0$

$x-4=0$ $x+3=0$

$x=4$ $x=-3$

HA: $y=\frac{a}{b}$

$y=2$

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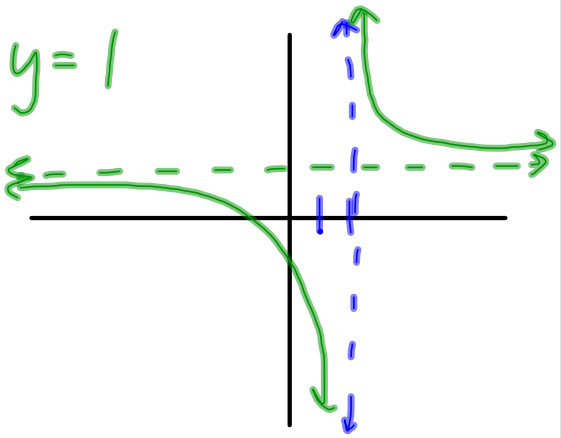
Graph $y = \frac{x+2}{x-2}$ showing asymptotes.

VA: $x-2=0$

$x=2$

HA: $y=1$



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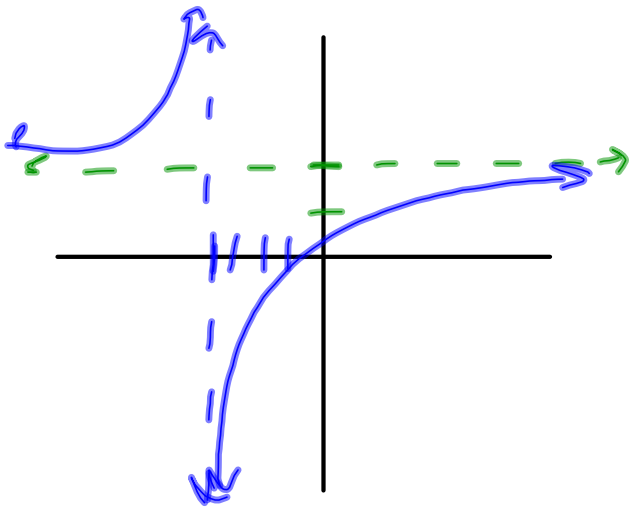
Graph: $y = \frac{2x-1}{x+4}$

VA: $x+4=0$

$x=-4$

HA: $y=2$



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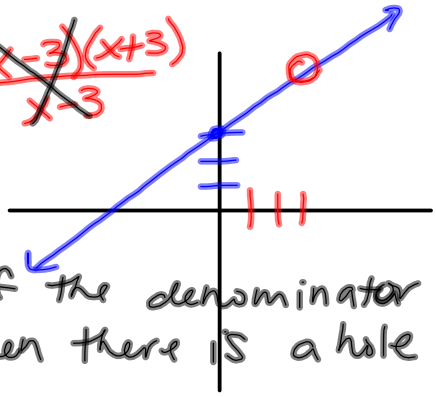
Holes

$$y = \frac{x^2 - 9}{x - 3} = \frac{(x-3)(x+3)}{x-3}$$



If $x-b$ is a factor of the denominator & the numerator, then there is a hole in the graph @ $x = b$.

VA: ~~$x - 3 = 0$~~ ~~$x = 3$~~

Hole: $x - 3 = 0$ $x = 3$

HA: none

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Identify all asymptotes & holes in the graph:

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

VA: $x^2 + 2x - 3 = 0$

$(x+3)(x-1) = 0$

~~$x = -3$~~ $x = 1$

Holes: $x + 3 = 0$ $x = -3$

HA: none

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