 Arroyo P.6 4/4/22

Notes: 29.3 Rational Graphs (Round 3)

Holes (AKA removable discontinuity)

LOOK OUT FOR HOLES AT ALL TIMES
IF THERE IS A HOLE, IT SUPERSEDES ANY ASYMPTOTES OR INTERCEPTS

They are points: (x, y)

Find the x-value of the factor(s) that get canceled out when those cancelled factor(s)= 0, then plug that x-value into the simplified equation (after you've canceled) to determine the y-value.

y-intercept	x-intercept(s)
It is a point: $(0, y)$	They are points: $(x, 0)$
Find y-value when $x = 0$	Find x-value when numerator $= 0$

Vertical asymptote(s)	Horizontal asymptote
They are lines: $x = \#$	It is a line: $y = \#$
Find x-value when denominator $= 0$	① degree num < degree denom: $y = 0$ ② degree num = degree denom: $y = \frac{\text{leading coefficient}}{\text{leading coefficient}}$ ③ degree num > degree denom: no HA
A vertical asymptote can NEVER be crossed	*A horizontal asymptote CAN be crossed (…wait for Precalculus for that!)*

Graph the function by identifying any holes, any intercepts, any asymptotes, and possibly testing more points. Then state D & R.

1) $f(x) = \frac{x^2-4}{x^3-3x^2-10x} = \frac{(x-2)(x+2)}{x(x^2-3x-10)} = \frac{(x-2)\cancel{(x+2)}}{x(x-5)\cancel{(x+2)}}$

Holes: $(-2, -\frac{2}{7})$

y-int: ~~(0,~~ No y-int

x-int: $(2, 0)$

VA: $x = 0$, $x = 5$

HA: $y = 0$

$f(x) = \frac{x-2}{x(x-5)}$

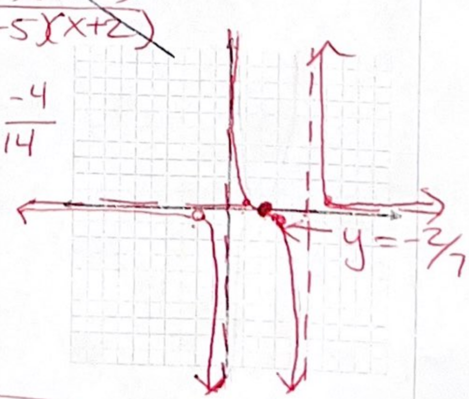
$y = \frac{-2-2}{-2(-2-5)} = \frac{-4}{14}$

test

$x = 1$ → $y = \frac{1}{3}$

$x = 3$ → $y = -\frac{1}{6}$

$x = 6$ → $y = \frac{2}{3}$



$\boxed{D: (-\infty, -2) \cup (-2, 0) \cup (0, 5) \cup (5, \infty)}$

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

2) $f(x) = \frac{x^2+5x-14}{x^2-4} = \frac{(x+7)\cancel{(x-2)}}{(x+2)\cancel{(x-2)}}$ hole: $x = 2$ $f(x) = \frac{x+7}{x+2}$

Hole: $(2, 9/4) = (2, 2.25)$

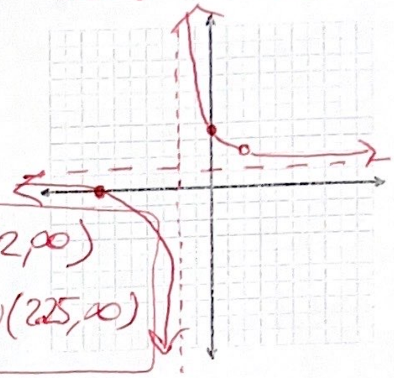
y-int: $(0, 7/2) = (0, 3.5)$

x-int: $(-7, 0)$

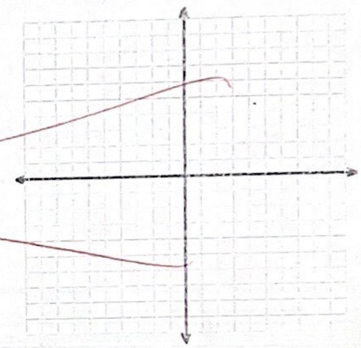
VA: $x = -2$

HA: $y = \frac{1}{1} = 1$

$$\boxed{\begin{array}{l} D: (-\infty, -2) \cup (-2, 2) \cup (2, \infty) \\ R: (-\infty, 1) \cup (1, 2.25) \cup (2.25, \infty) \end{array}}$$



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



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