

GRAPHING RATIONAL FUNCTIONS #1

Directions: Identify any holes, asymptote, x-intercept, and y-intercept. Then sketch a graph.

1.) $y = \frac{3x}{x-4}$

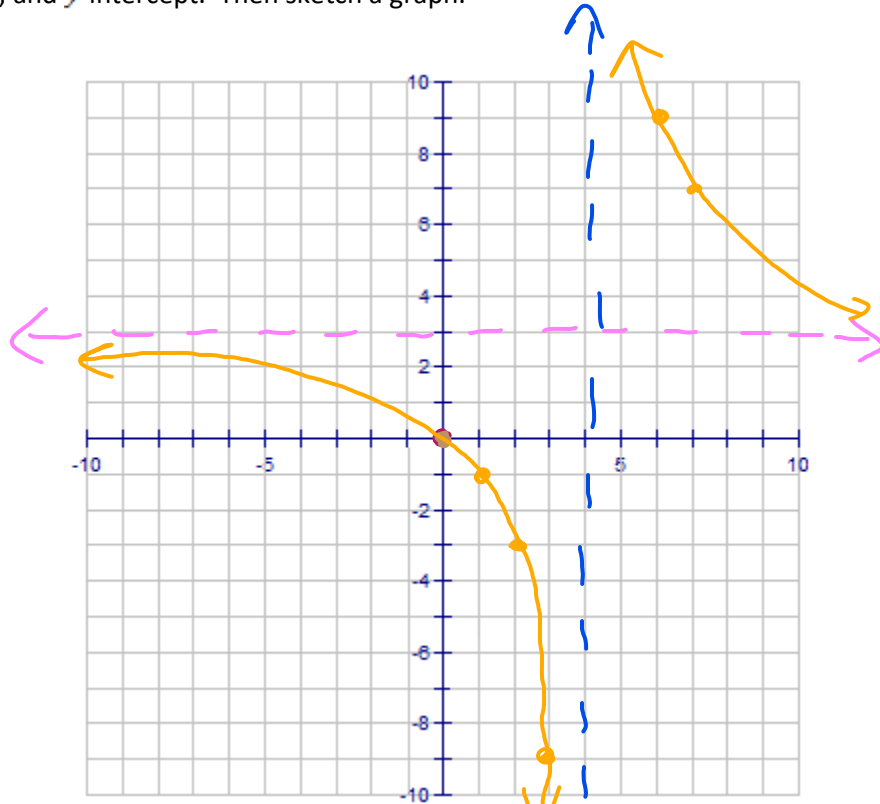
Common
Holes: none

leftover in VA:
bottom $x-4=0$
 $+4 \quad +4$
 $x=4$

same H/A:
 $y = \frac{3}{1} = 3$

x-int:
(y=0) $0 = \frac{3x}{x-4} \cdot (x-4)$
 $\frac{0}{3} = \frac{3x}{3}$ $x=0$

y-int:
(x=0) $y = \frac{3 \cdot 0}{0-4} = \frac{0}{-4} \Rightarrow$ $y=0$



(before 4)

x	
1	$\frac{3 \cdot 1}{1-4} = \frac{3}{-3} = -1$
2	$\frac{3 \cdot 2}{2-4} = \frac{6}{-2} = -3$
3	$\frac{3 \cdot 3}{3-4} = \frac{9}{-1} = -9$

(after 4)

x	
5	$\frac{3 \cdot 5}{5-4} = \frac{15}{1} = 15$
6	$\frac{3 \cdot 6}{6-4} = \frac{18}{2} = 9$
7	$\frac{3 \cdot 7}{7-4} = \frac{21}{3} = 7$

HOLE(S)	* VERTICAL ASYMPTOTE(S) *	HORIZONTAL ASYMPTOTE	x-intercept(s)	y-intercept
none	$x=4$	$y=3$	$x=0$	$y=0$

lines points

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

difference of squares

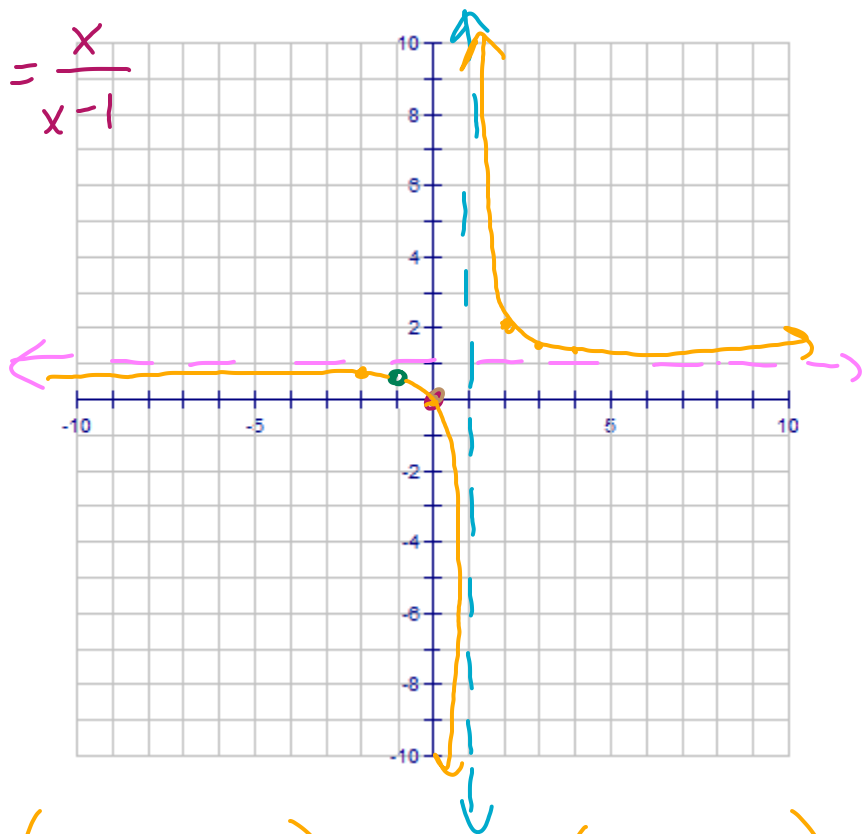
Common Holes: $x+1=0$
 $x=-1$

leftover in bottom VA: $x-1=0$
 $*x=1*$

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

X-int: $(x=0)$
 $0 = \frac{x}{x-1} \cdot (x-1)$
 $0 = x$

Y-int: $(x=0)$
 $y = \frac{0}{0-1} = \frac{0}{-1}$
 $y = 0$



(before 1)

x	y = $\frac{x}{x-1}$
-2	$\frac{-2}{-2-1} = \frac{-2}{-3} = \frac{2}{3}$
-1	$\frac{-1}{-1-1} = \frac{-1}{-2} = \frac{1}{2}$
0	$\frac{0}{0-1} = \frac{0}{-1} = 0$

(after 1)

x	y = $\frac{x}{x-1}$
2	$\frac{2}{2-1} = \frac{2}{1} = 2$
3	$\frac{3}{3-1} = \frac{3}{2} = 1\frac{1}{2}$
4	$\frac{4}{4-1} = \frac{4}{3} = 1\frac{1}{3}$

HOLE(S)	VERTICAL ASYMPTOTE(S)	HORIZONTAL ASYMPTOTE	x-intercept(s)	y-intercept
$(-1, \frac{1}{2})$	$x=1$	$y=1$	$x=0$	$y=0$