

Rationals

Fraction

How do you multiply rationals?

$$\frac{2}{5} \rightarrow \frac{1}{3} = \frac{2}{15}$$

How do you divide rationals?

$$\frac{2}{5} \div \frac{1}{3} =$$

$$\frac{2}{5} \rightarrow \frac{3}{1} = \frac{6}{5}$$

copy change flip

Rational Multiplication:

Steps:

- 1) Make you Parenthesis
- 2) Multiply straight across
- 3) Simplify **FACTOR**
- 4) Find your asymptotes & holes

↑
left over
in bottom

↑
cancel out $\frac{\text{top}}{\text{bottom}}$

$$1) \frac{b+7}{b-3} \cdot \frac{b^2+3b-18}{b+6}$$

$$2) \frac{8v^2+64v}{v^2+11v+24} \cdot \frac{v+3}{v-7}$$

$$1) \frac{b+7}{b-3} \cdot \frac{b^2+3b-18}{b+6}$$

$\begin{array}{r} 3 \text{ add} \\ -3 \quad +6 \\ \hline -18 \end{array}$ multiply

$$\frac{(b+7) \overset{\text{hole}}{\cancel{(b-3)}} \overset{\text{hole}}{\cancel{(b+6)}}}{\cancel{(b-3)} \cancel{(b+6)}}$$

Holes:

$$b-3=0 \quad b+6=0$$

$$b=3 \quad b=-6$$

$$1) \frac{(b+7)(b^2+3b-18)}{(b-3)(b+6)} \quad \begin{array}{c} 3 \\ -3 \quad +6 \\ -18 \end{array}$$

$$\frac{(b+7) \cancel{(b-3)} \cancel{(b+6)}}{\cancel{(b-3)} \cancel{(b+6)}}$$

$$\begin{array}{l} \text{Holes: } b-3=0 \quad b+6=0 \\ \quad \quad b=3 \quad \quad b=-6 \end{array}$$

$$2) \frac{(8v^2 + 64v)(v+3)}{(v^2 + 11v + 24)(v-7)}$$

$$+11 = \frac{-}{-} \cdot \frac{-}{-} = 24$$

$$\frac{8v(\cancel{v+8})(\cancel{v+3})}{(\cancel{v+3})(\cancel{v+8})(v-7)}$$

hole

$$(\cancel{v+3})(\cancel{v+8})(v-7)$$

Hole

$$v+3=0$$

$$v=-3$$

$$v+8=0$$

$$v=-8$$

asymptote

$$v-7=0$$

$$v=7$$

$$1) \frac{b+7}{b-3} \cdot \frac{b^2+3b-18}{b+6}$$

$$3) \frac{7}{n+10} \cdot \frac{n^2 + 12n + 20}{7}$$

$$\frac{\cancel{7} \cdot \overset{\text{Hole}}{\cancel{(n+10)}}(n+2)}{(\cancel{n+10}) \cdot \cancel{7}}$$

Holes

$$n+10=0$$

$$n=-10$$

v: asymptote

~~2=0~~

None

$$\frac{\cancel{2}}{2} \cdot \frac{\cancel{3}}{2} \cdot \frac{\cancel{x}}{x} \cdot \frac{\cancel{(3x-2)}}{\cancel{(3x-2)}}$$

$$4) \frac{2}{6x-4} \cdot \frac{9x^2 - 6x}{2x}$$

$$\frac{\cancel{2} \cdot \cancel{3} \cdot \cancel{(3x-2)}}{\cancel{2}(\cancel{3x-2}) \cdot \cancel{2}}$$

Holes:

$$3x-2=0$$

$$x=0$$

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

$$\frac{\cancel{2} \cdot \cancel{3} \cdot \cancel{x} \cdot \cancel{(3x-2)}}{\cancel{2} \cdot \cancel{2} \cdot \cancel{x} \cdot \cancel{(3x-2)}}$$

$$\frac{\cancel{2} \cdot \cancel{2} \cdot \cancel{x} \cdot \cancel{(3x-2)}}{\cancel{2} \cdot \cancel{2} \cdot \cancel{x} \cdot \cancel{(3x-2)}}$$

$$\frac{\cancel{2} \cdot \cancel{2} \cdot \cancel{x} \cdot \cancel{(3x-2)}}{\cancel{2} \cdot \cancel{2} \cdot \cancel{x} \cdot \cancel{(3x-2)}}$$

$$5) \frac{7x^2 + 28x}{x - 10} \cdot \frac{x - 10}{x^2 + 2x - 8}$$

$$6) \frac{1}{k - 1} \cdot \frac{k^2 + 2k - 3}{k + 5}$$

$$7) \frac{a^2 - 64}{8a^2} \cdot \frac{a + 5}{a^2 + 13a + 40}$$

$$8) \frac{1}{p - 10} \cdot \frac{2p^3 - 20p^2}{p - 1}$$

$$9) \frac{n+8}{2} \cdot \frac{2}{7n^3+14n^2}$$

$$10) \frac{x^2+2x-35}{x-8} \cdot \frac{x-8}{6x-30}$$

1) $b + 7; \{3, -6\}$

2) $\frac{8v}{v-7}; \{-3, -8, 7\}$

3) $n + 2; \{-10\}$

4) $\frac{3}{2}; \left\{\frac{2}{3}, 0\right\}$

5) $\frac{7x}{x-2}; \{10, -4, 2\}$

6) $\frac{k+3}{k+5}; \{1, -5\}$

7) $\frac{a-8}{8a^2}; \{0, -5, -8\}$

8) $\frac{2p^2}{p-1}; \{10, 1\}$

9) $\frac{n+8}{7n^2(n+2)}; \{0, -2\}$

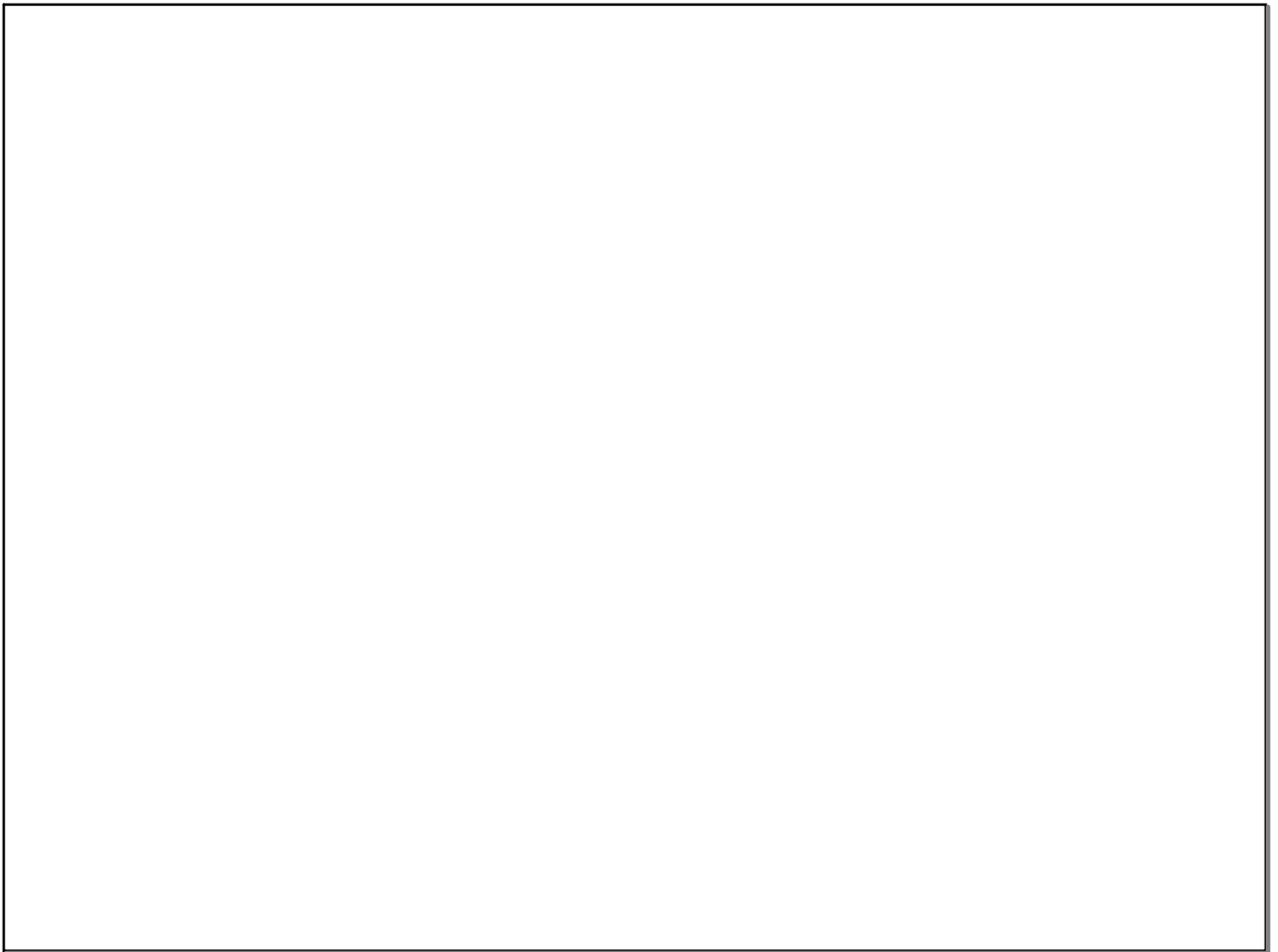
10) $\frac{x+7}{6}; \{8, 5\}$

Rational Division:

Steps:

- s:
- 1) Make you Parenthesis
 - 2) **Copy - Change - Flip**
 - 3) Multiply straight across
 - 4) Simplify
 - 5) Find your asymptotes & holes
-
- 1) Make you Parenthesis
- 2) **Copy - Change - Flip**
- 3) Multiply straight across
- 4) Simplify
- 5) Find your asymptotes & holes

$$\frac{n+2}{3n^2-15n} - \frac{2n-4}{3}$$



$$11) \frac{m+1}{m+5} \div \frac{m+1}{5m+25}$$

$$12) \frac{r+3}{4} \div \frac{r^2+r-6}{r^2-12r+20}$$

$$12) \frac{r+3}{4} \div \frac{r^2+r-6}{r^2-12r+20}$$

$$\frac{\cancel{r+3}}{4} \cdot \frac{(\cancel{r-2})(r-10)}{(\cancel{r+3})(\cancel{r-2})}$$

hole
 $r = 2$ ~~hole~~
 $v = -3$

$$11) \frac{m+1}{m+5} \div \frac{m+1}{5m+25}$$

$$\frac{\cancel{(m+1)}}{\cancel{(m+5)}} \cdot \frac{5\cancel{(m+5)}}{\cancel{(m+1)}}$$

$$\begin{array}{l} m+1=0 \quad m+5=0 \\ m=-1 \quad m=-5 \end{array}$$

$$12) \frac{r+3}{4} \div \frac{r^2+r-6}{r^2-12r+20}$$

$$\frac{\cancel{(r+3)}}{4} \cdot \frac{(r-10)\cancel{(r-2)}}{\cancel{(r+3)}\cancel{(r-2)}}$$

hole $r-2=0$
 $r=2$

$r+3=0$
 $r=-3$

$$11) \frac{m+1}{m+5} \div \frac{m+1}{5m+25}$$

Copy

$$\frac{(m+1)}{(m+5)}$$

change



Flip

$$\frac{(5m+25)}{(m+1)}$$

$$\frac{\cancel{(m+1)} 5 \cancel{(m+5)}}{\cancel{(m+5)} \cancel{(m+1)}}$$

holes

$$m = -5 \quad m+5=0$$

$$m = -1 \quad m+1=0$$

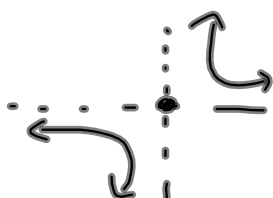
$$12) \frac{r+3}{4} \div \frac{r^2+r-6}{r^2-12r+20}$$

$$\frac{\cancel{(r+3)} \cdot \cancel{(r-10)} \cancel{(r-2)}}{4 \cdot \cancel{(r+3)} \cancel{(r-2)}}$$

$$\text{holes } r+3=0 \quad r-2=0$$

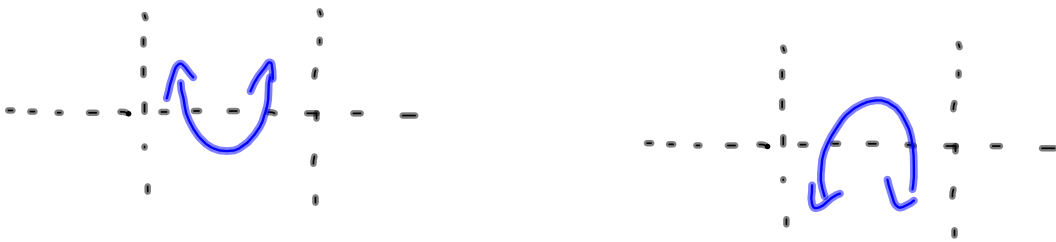
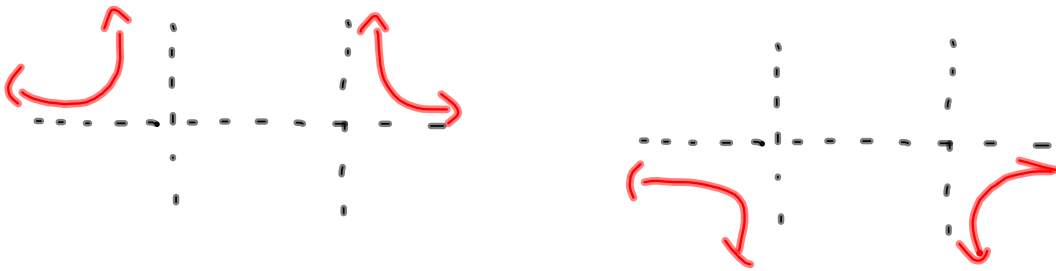
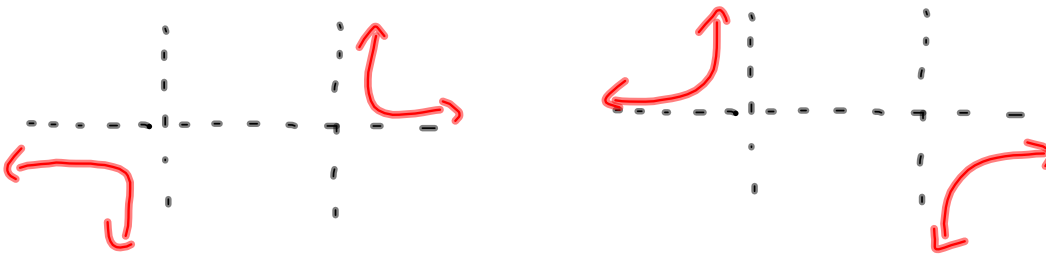
$$r=-3 \quad r=2$$

Rational Shapes

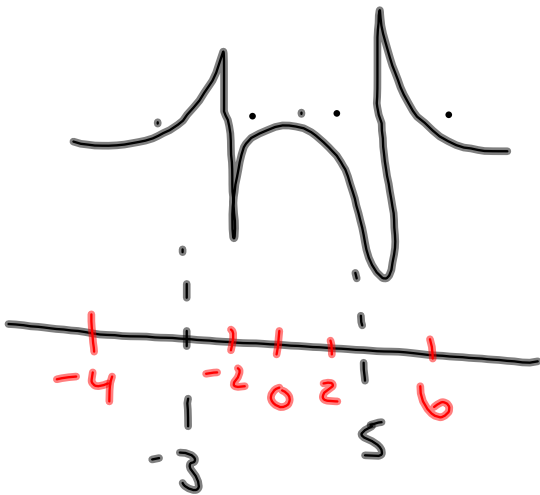


one vertical
asymptote

two vertical asymptotes



Set 2nd → table
Graph



$$11) \frac{(m+1)}{(m+5)} \div \frac{(m+1)}{(5m+25)}$$

copy change flip

$$\frac{(m+1)}{(m+5)} \cdot \frac{(5m+25)}{(m+1)}$$

$$\frac{\overset{\text{Hole}}{\cancel{(m+1)}} \cdot 5 \cdot \overset{\text{Hole}}{\cancel{(m+5)}}}{\cancel{(m+5)} \cancel{(m+1)}}$$

$$\text{Hole : } m+5=0 \quad m+1=0$$

$$m=-5 \quad m=-1$$

$$13) \frac{1}{x-4} \div \frac{x-10}{5x^2-20x}$$

$$14) \frac{5n^2}{3n+3} \div \frac{1}{n+1}$$

$$15) \frac{v^2 - 8v - 20}{2v^3 + 4v^2} \div \frac{v - 10}{v - 1}$$

$$16) \frac{x - 9}{7x - 35} \div \frac{x - 1}{7}$$

$$17) \frac{1}{b-9} \div \frac{8b}{-b^2+17b-72}$$

$$18) \frac{1}{3n^2+30n} \div \frac{n+2}{n^2-4}$$

$$19) \frac{6a^2 + 12a}{6a} \div \frac{6a}{8}$$

$$20) \frac{1}{k+5} \div \frac{2}{9k^2 + 45k}$$

$$11) \frac{8a^2}{5}; \{-5, -1\}$$

$$12) \frac{p-1}{r-10}; \{2, 10, -3\}$$

$$13) \frac{5x}{x-10}; \{4, 0, 10\}$$

$$14) \frac{5n^2}{3}; \{-1\}$$

$$15) \frac{v-1}{2v^2}; \{0, -2, 1, 10\}$$

$$16) \frac{x-9}{(x-5)(x-1)}; \{5, 1\}$$

$$17) \frac{-b+8}{8b}; \{9, 8, 0\}$$

$$18) \frac{n-2}{3n(n+10)}; \{0, -10, -2, 2\}$$

$$19) \frac{4(a+2)}{3a}; \{0\}$$

$$20) \frac{9k}{2}; \{-5, 0\}$$

