Please take detailed notes and put away anything unrelated to taking notes.

Rational Functions with Holes:

Consider the function $f(x)=\frac{10x-30}{x^2-1x-6}$, $N(x)=10x-30$, $D(x)=x^2-x-6$

1 → factor: $f(x)=\frac{10(x-3)}{(x-3)(x+2)}$,

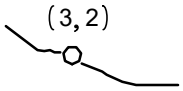
2 → equation(s) of vertical asymptotes: $\frac{10(x-3)}{(x-3)(x+2)}$ .. the non-repeating bottom gives the VA

$x+2\neq 0$

$x\neq -2$ ⇐ vertical asymptote in MOM..put in x=-2

3 → N otice $\frac{10(x-3)}{(x-3)(x+2)}$.. set the repeating part equal to 0: $x-3=0\rightarrow x=3$

Since x-3 repeats, cancel it: $\frac{10}{x+2}$ and evaluate at x=3 : $\frac{10}{3+2}=\frac{10}{5}=2=y$ } so there is a hole at x=3, y=2.




4 → Horizontal asymptotes: $x=10000:\ f(10000)=\frac{10\cdot 10000-30}{10000^2-10000-6}\xrightarrow{\text{calculator work...}}10\cdot 10^{-4}$ ⇐ very small number

As $x\rightarrow\infty, y\rightarrow 0$ So the horizontal asymptote is y=0. (we approach y=0 but NEVER REACH IT)

5 → x intercept/(s) as (x,y) pairs: $f(x)=0\Leftarrow y$

$\frac{10x-30}{x^2-x-6}=0\xrightarrow{\text{cross multiply}}10x-30=0(x^2-x-6)\xrightarrow{0\cdot\text{whatever}=0}10x-30=0\xrightarrow{\text{get x}}x=30/10=3$

subtle: seems x intercpet is x=3, but rememer that f(3) is not defined ..use original function: $f(3)=\frac{10\cdot 3-30}{3^2-3-6}=\frac{30-30}{9-3-6}=\frac{0}{0}$ ← not defined!

so there is no x-intercpet!

6 → *domain* in interval notation: x=-2 = *VA*, $x=3=hole$: $-\infty\ldots <$ ---------- -2 ---------- 3 ----------> $\ldots\infty$ (x)

interval notation: $(-\infty,-2)\cup(-2,3)\cup(3,\infty)$

7 → range in interval notation:

.. ∞

lower to higher!

2 = y (hole)

y = 0 (HA)

.. −∞

interval notation: $(-\infty,0)\cup(0,2)\cup(2,\infty)$

8 → y intercept: $f(0)=\frac{10\cdot 0-30}{0^2-0-6}$

$=\frac{-30}{-6}=5$

(0, 5) is on graph!

9 → $x=-3:\ f(-3)=\frac{10(-3)-30}{(-3)^2-(-3)-6}$

$=\frac{-60}{9+3-6}$

$=\frac{-60}{12-6}=\frac{-60}{6}=-10$

point is (−3, −10)