Precalculus Sec 2.7
Graphs of Rational Functions

- an asymptote that is not horizontal and not vertical is called an **oblique asymptote** .

- a rational function will have an oblique asymptote when the degree of the numerator is one more than the degree of the denominator

- the equation of the oblique asymptote is the quotient found by dividing the numerator by the denominator (the remainder does NOT matter)

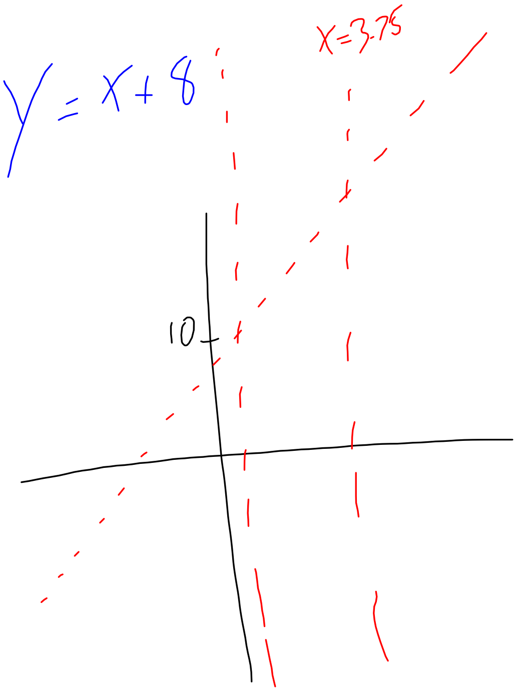
Example

Find the oblique asymptote, if there is one.

$$f(x)=\frac{x^3+4x^2-7x+3}{x^2-4x+1}$$

$$\begin{array}{r} x+8 \\ x^2-4x+1 \overline{\big)\, x^3+4x^2-7x+3} \\ -(x^3-4x^2+x) \\ \hline 8x^2-8x+3 \\ -(8x^2-32x+8) \\ \hline 24x-5 \end{array}$$

$y=x+8$



$$x=\frac{4\pm\sqrt{16-4}}{2}=\frac{4\pm\sqrt{12}}{2}\approx$$

To graph a rational function by hand...

1) Find all the following.

x-intercepts - zeros of numerator
y-intercepts - plug in zero for x
vertical asymptotes - see notes for sec 2.6
horizontal asymptotes - see notes for sec 2.6
oblique asymptote - notes for this section
holes - see notes for sec 2.6

2) Plot at least one point between and one point beyond each x-intercept and vertical asymptote. Use smooth curves to complete the graph.

<u>*Example*</u> Identify the x and y intercepts, any horizontal, vertical, oblique asymptotes, and any holes in the graph, and the domain. Then sketch a graph of the function using this information

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

$$\frac{(x-2)(x+1)}{x-1}$$

$$\begin{array}{r|rrr} 1 & 1 & -1 & -2 \\ & & 1 & 0 \\ \hline & 1 & 0 & -2 \end{array}$$

X-inter: 2, -1

Y-inter: 2

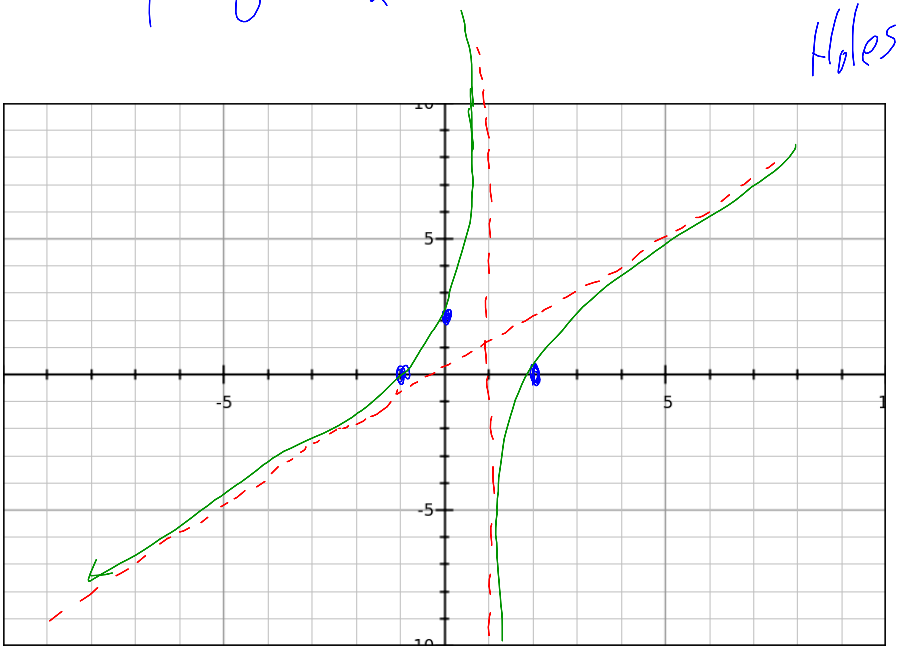
H.A.: ______

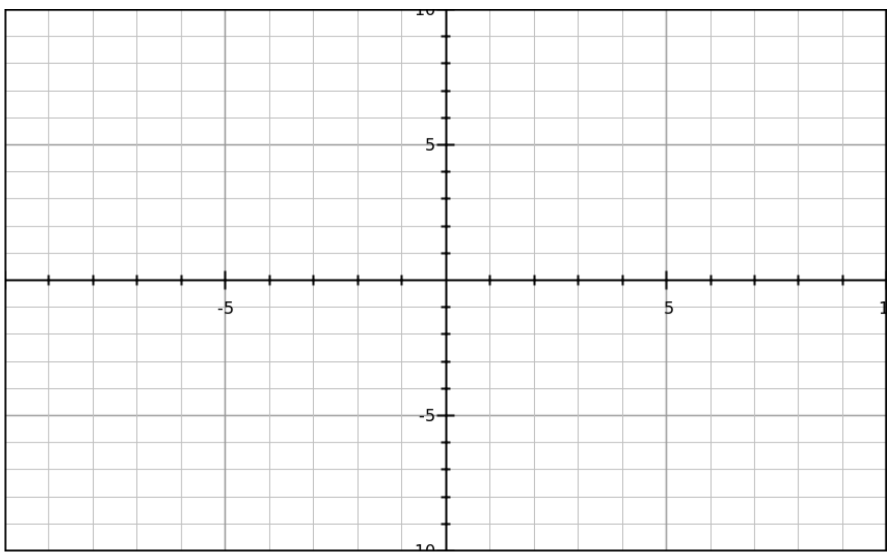
V.A.: $x=1$

O.A.: $y=x$

Holes: ______

D: $\mathbb{R}$, $x\neq1$

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