SUMMARY OF HOW TO FIND ASYMPTOTES

Vertical Asymptotes are the values that are NOT in the domain. To find them, set the denominator = 0 and solve.

To determine horizontal or oblique asymptotes, compare the degrees of the numerator and denominator.

- If the degree of the top < the bottom, horizontal asymptote along the *x* axis (*y* = 0)
- If the degree of the top = bottom, horizontal asymptote at *y* = leading coefficient of top over leading coefficient of bottom
- * If the degree of the top > the bottom, oblique asymptote found by long division.

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OBLIQUE ASYMPTOTES

degree of top = 3

$$R(x)=\frac{x^3+2x^2-3x+5}{x^2-3x+4}$$

degree of bottom = 2

If the degree of the numerator is greater than the degree of the denominator, then there is not a horizontal asymptote, but an oblique one. The equation is found by doing long division and the quotient is the equation of the oblique asymptote ignoring the remainder.

$$\begin{array}{r} x+5 \\ x^2-3x+4\,\overline{)\,x^3+2x^2-3x+5} \\ -(x^3-3x^2+4x) \\ \hline 5x^2-7x+5 \\ -(5x^2-15x+20) \\ \hline 8x-15 \end{array}$$

Oblique asymptote at *y* = *x*

$y = x+5$

$\boxed{x+5}$ + a remainder

$$\frac{x^3+2x^2-3x+5}{x^2-3x+4} = x+5+\frac{8x-15}{x^2-3x+4}$$

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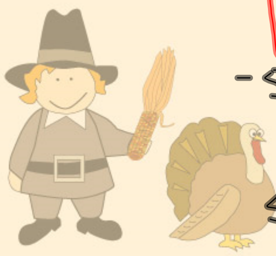
$$y = \frac{4x^4 - 3x^3 + 11x^2 - 7x + 4}{x^3 + x^2 - 25x - 25}$$

$x^2(x+1) - 25(x+1)$

$\cancel{(x+1)}\cancel{(x+5)}(x-5)$



$$\begin{array}{r|rrrrr}
-1 & 4 & -3 & 11 & -7 & 4 \\
 & \downarrow & -4 & 7 & -18 & 25 \\
\hline
-5 & 4 & -7 & 18 & -25 & \boxed{29} \\
 & \downarrow & -20 & 135 & -765 & \\
\hline
5 & 4 & -27 & 153 & \boxed{-790} & \\
 & \downarrow & 20 & -35 & & \\
\hline
 & 4 & -7 & \boxed{118} & &
\end{array}$$

$y = 4x - 7$

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$$\frac{144}{24} = 6$$

$\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{3}$

$\cancel{72}$

$\cancel{36}$

$\cancel{18}$

6

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7 $f(x)=\dfrac{x^2-x-2}{x-1}=\dfrac{(x-2)(x+1)}{(x-1)}$

a) $\{x\in\mathbb{R} \mid x\neq 1\}$ or $(-\infty,1)\cup(1,\infty)$

b) no holes

c) VA $x=1$

d) HA none

e) OA: $y=x$

f) $(0,2)$

g) $(2,0)$ $(-1,0)$

$f(0)=\dfrac{0^2-0-2}{0-1}=\dfrac{-2}{-1}=2$

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

$y=1x+0$

$$\begin{array}{r} x+0 \\ x-1\overline{)\,x^2-x-2} \\ -(x^2-x) \\ \hline \cancel{0x}-2 \end{array}$$

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