Asymptotes

Simplified Method

1. Find horizontal asymptote lines. (see below)
2. Find vertical asymptote lines. (see below)
3. Draw the lines (dotted)
4. For each sector bounded by **vertical asymptote lines**, pick an x and plot the point.
5. Draw Curving line to the asymptotes from each special x

Note: Plotting extra points can help guide you .

General Method

1. **Horizontal Asymptotes** for $R(x)=\frac{P(x)}{Q(x)}$, P(x) and Q(x) polynomials.

   A. Only the leading coefficients of P and Q matter. So decide for $\frac{ax^m}{bx^n}$

   B. If m> n, there is no asymptote.

   If m= n, $y=\frac{a}{b}$ is the asymptote. Let c < d be x values past all roots of Q(x).
   Find R(c) and R(d) to decide if approach is from above or below.

   If m < n, $y=0$ is the asymptote. Let c < 0 and d>0, |c| and |d| *very large.*
   Find R(c) and R(d) to decide if approach is from above or below.

Note: c and d stand for -∞ and ∞.

2. **Vertical Asymptotes** are where f(x) = -∞ or ∞.

   To find the Vertical Asymptotes for $f(x)=\frac{g(x)}{Q(x)}$, Q(x) polynomial.

   Find **All** roots of Q(x), a ,b , c, … Each of x=a , x=b … is an asymptote..

   Find f(a+) and f(a-) to decide if → -∞ or ∞ on each side of a. Likewise for b , etc

Solving Inequalities **Rename so a<b (-b< -a)**

1. Solve (x+a) (x+b) < 0 . Answer: -b < x < -a .
2. Solve (x+a) (x+b) > 0 . Answer: x < -b **OR** x > -a .

Solving Absolute value Inequalities

3. |x-a| < r means : a -r < x < a + r .
4. |x+a| < r means : -a-r < x < -a + r .
5. |x-a| > r means : x < a -r OR x > a + r

Intercepts

1. y-intercept. Set x = 0 and solve for y (y=c). y-intercept is (0,c).
2. x-intercept. Set y = 0 and solve for x (x=k). x-intercept is (k,0).