

THE EIGHT LEGENDARY STEPS IN GRAPHING RATIONAL FUNCTIONS

WHAT TO DO?	HOW TO DO IT?
1. Factor but don't cancel and find the domain.	Domain is all real numbers except whatever makes the denominator zero.
2. Simplify. Use this simplified result from this point on.	Cancel if you can but don't forget the restrictions. These restrictions will be empty holes in the graph, if the factor is totally cancelled out of the denominator.
3. Find the intercepts.	To find the x-intercept: Let $y=0$ and solve for $x \rightarrow (?, 0)$ To find the y-intercept: Let $x=0$ and solve for $y \rightarrow (0, ?)$
4. Find the vertical asymptotes. (VA)	Find the zeros of the denominator (c.v. of the denominator). Each zero is a VA. (Make sure to use the simplified form from step 2.)
5. Find the horizontal (HA) or oblique asymptote.	Three rules to follow: (comparing the degree of the numerator versus the denominator) A. If degree of the numerator < degree of the denominator, then HA. is $y = 0$ (or the x-axis) B. If degree of the numerator = degree of the denominator, then HA. is $y = \frac{\text{leading coefficient of numerator}}{\text{leading coefficient of denominator}}$ C. If degree of the numerator > degree of the denominator, then there are no HA. However, if the degree of the numerator is one degree more than the degree of the denominator then there is an oblique asymptote. Do long division and the oblique asymptote is $y = \text{the quotient (answer of the division)}$. (disregard the remainder)
6. Check if the graph crosses the HA (if any).	Set the functions (from step 2) equal to the HA. and solve for x . If you get any result(s) then the graph will cross the HA. and this result of x is where the graph crosses the HA.
7. Do sign analysis.	Find the critical values (from step 2). Setup a sign analysis table like the following: assuming cv1, cv2, and cv4 came from the numerator and cv3 and cv5 came from the denominator. <div style="text-align: center;"> </div>
8. Sketch the graph.	Words of wisdom!: <ul style="list-style-type: none"> • Draw the VA, HA (or oblique asymptote) • Plot the x and y intercepts. • Plot the point(s) of intersection of the graph and the HA (if any) • Work around the VA by referring to the table and analyzing the position of the graph with respect to the x-axis (above or below x-axis). So, Ask yourself: "Where should the graph be to the left of each VA?" AND "Where should the graph be to the right of the each VA?" Mark the positions next to each VA by drawing a small trace. • Use the traces and all the given points to sketch the graph. • Don't forget the empty holes (if any).