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Steps in graphing a rational function

Step 1: Find Domain:

- *Find the restrictions on the variable*
- $\frac{1}{x}, x \neq 0$
- $\sqrt{x},\ x \geq 0$

Step 2: Find Vertical Asymptote:

- *Set denominator equal to zero and solve.*
- $x - a = 0,\ x = a$ *is the vertical asymptote*

Step 3: Find Horizontal Asymptote:

- $f(x) = \frac{P(x)}{Q(x)}$
- *If the degree of* $P(x)$ *is less than the degree of* $Q(x)$*, the line* $y = 0$ *is the horizontal asymptote*
- *If the degree of* $P\ (x)$ *is equal to the degree of* $Q(x)$*, the line*
- $y = \frac{p}{q}$ *is the horizontal asymptote. Where p is the leading coefficients of the numerator and q is the leading coefficient of the denominator*
- *If the degree of* $P(x)$ *is greater than the degree of* $Q(x)$*, then there is no horizontal asymptote.*

Step 4: Find Slant Asymptote if any:

If the degree of $P(x)$ *is one greater then the degree of* $Q(x)$*, there is a slant asympthote. To find it, divide* $P(x)$ *by* $Q(x)$ *and ignore the remainder. The quotient is the slant asymptote. Set equal to* y*.*

Step 5: Find x- and y- intercepts:

To find y intercept plug in a 0 *for every x and solve for* y*.* $(0, y)$
To find x inercept set equation to 0 *and solve for* x*.* $(x, 0)$

Step 6: Draw the graph:

- *Draw dashed lines for the horizontal, vertical, and slant asymptotes.*
- *Plot* 3 *points on the right side of the vertical asymptote*
  Plot 3 *points on the left of the vertical asymptote*
- *Connect the points and lead curve toward asymptotes.*