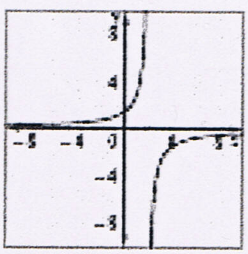
KEY CONCEPTS

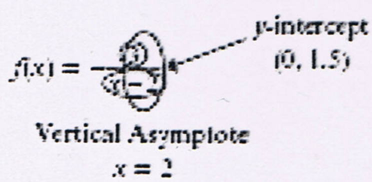
Rational functions take the form $f(x) = \frac{P(x)}{Q(x)}$, where $P(x)$ and $Q(x)$ are both polynomial functions and $Q(x) \neq 0$.

Four Critical Properties of a Rational Function

Property	Example $f(x) = -\frac{3}{x-2}$
X-intercepts	Let $f(x) = 0$ and solve for x. $0 = -\frac{3}{x-2}$ gives $0 = -3$, which is not true. $\therefore$ there are no x-intercepts for reciprocal linear functions (where the numerator is a constant).
Y-intercepts	$f(0)$ gives the y-intercept. $f(0) = -\frac{3}{0-2} = \frac{3}{2}$ $\therefore$ the y-intercept is -1.5.
Vertical Asymptotes	Let the denominator be 0 and solve for x. $x - 2 = 0$ $x = 2$ $\therefore$ the graph's vertical asymptote is $x = 2$. Also, note that the domain of the function is $x \neq 2, x \in \mathbb{R}$.
Horizontal Asymptotes	When the numerator is a constant, the rational function approaches the x-axis.

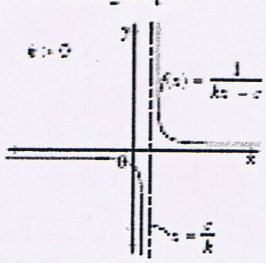


Horizontal Asymptote $y = 0$
No x-intercept

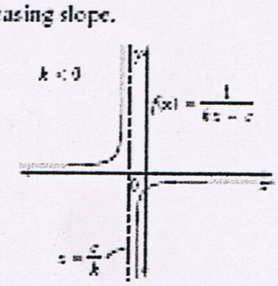


The horizontal asymptote of a reciprocal linear function has equation $y = 0$.

If $k > 0$, the left branch of a reciprocal linear function has a negative, decreasing slope, and the right branch has a negative, increasing slope.



If $k < 0$, the left branch of a reciprocal function has a positive, increasing slope, and the right branch has a positive, decreasing slope.



Homework: pg 153; # 1 – 5, 7odd, 8 – 10, 13 – 15