

Name _____ Block _____

Graph Rational Functions

$$f(x) = \frac{p(x)}{q(x)} = \frac{a_m x^m + \dots}{b_n x^n + \dots}$$

- 1) x-intercept are the real zeros of p(x)
- 2) vertical asymptotes at each real zero of q(x)
- 3) at most one horizontal asymptotes
 - if $m < n$, then $y = 0$ is the horizontal asymptote
 - if $m = n$, then $\frac{a_m}{b_n}$ is the horizontal asymptote
 - if $m > n$, then no horizontal asymptote.

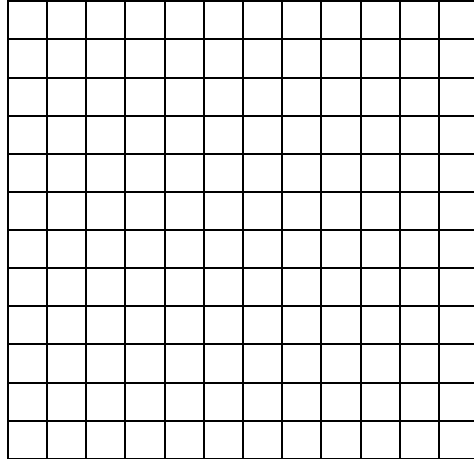
There is an oblique asymptote at $y = \frac{p(x)}{q(x)}$, ignore the remainder.

In this exercise:

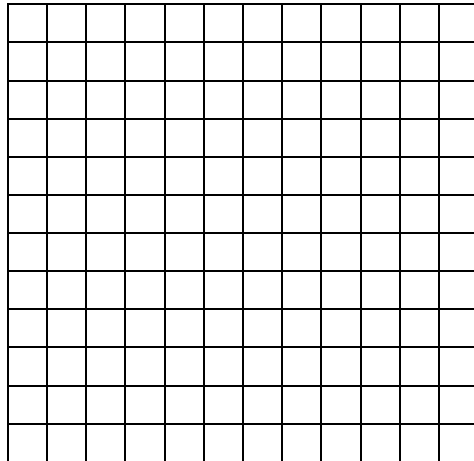
- 1) Find all the asymptotes
- 2) Find the zeros and the y-intercept, if possible
- 3) Sketch the graph

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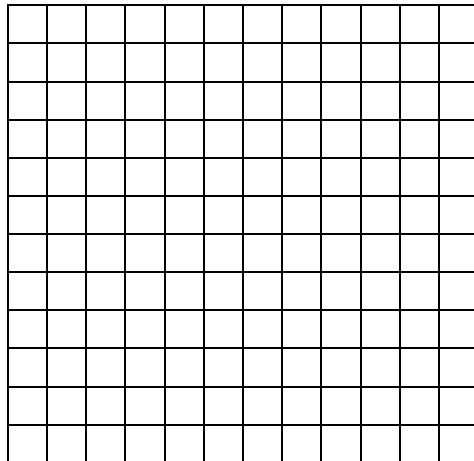
1) $y = \frac{x}{x-2}$



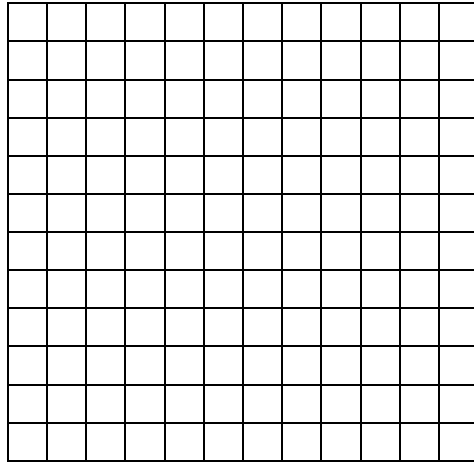
2) $y = \frac{2x-4}{3x+6}$



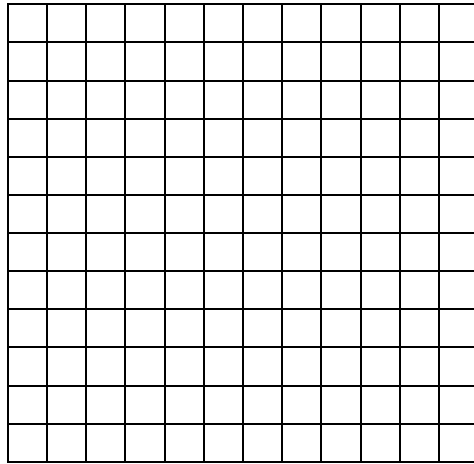
3) $y = \frac{-3x+1}{4x-8}$



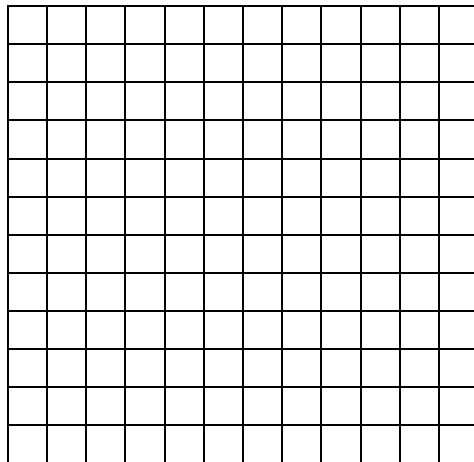
$$4) y = \frac{5}{x^2 + 4}$$



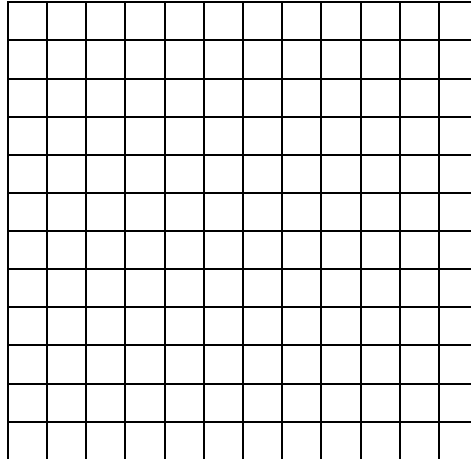
$$5) y = \frac{5x}{x^2 + 4}$$



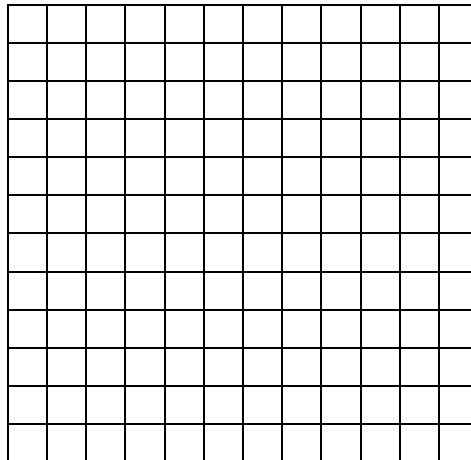
$$6) y = \frac{5x^2}{x^2 + 4}$$



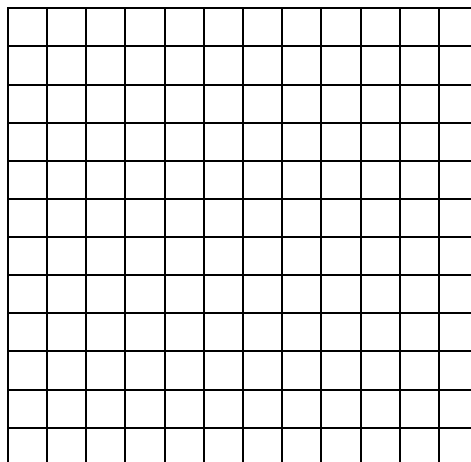
$$7) y = \frac{2}{x^2 - 4}$$



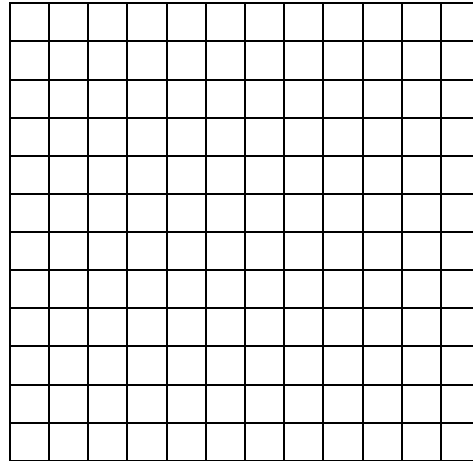
$$8) y = \frac{2x}{x^2 - 4}$$



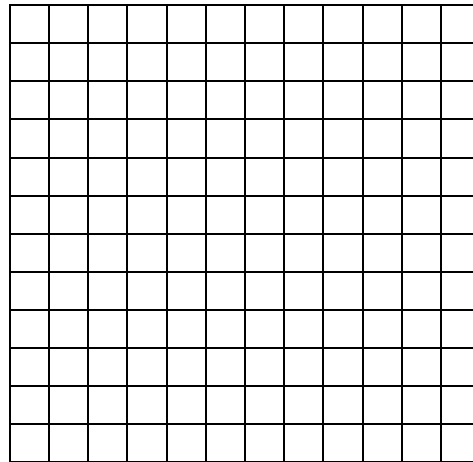
$$9) y = \frac{2x^2}{x^2 - 4}$$



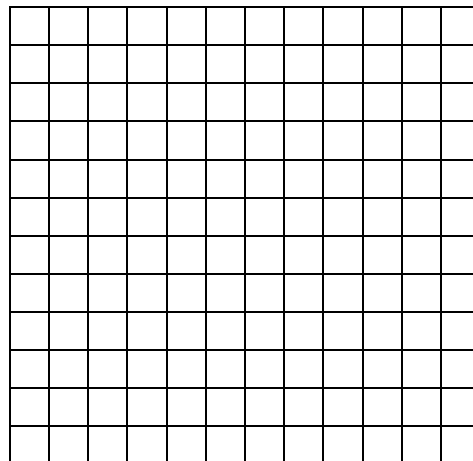
$$10) y = \frac{x^3}{x^2 - 1}$$



$$11) y = \frac{x^3}{x^2 + 4}$$

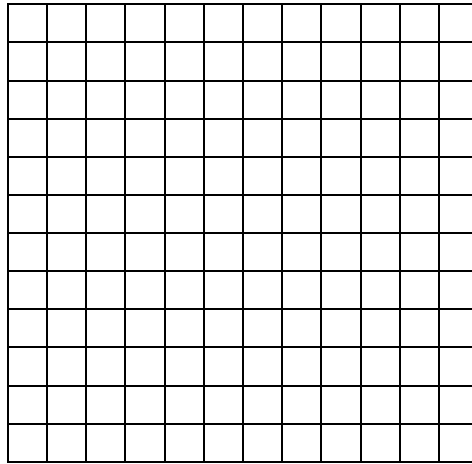


$$12) y = \frac{x^3}{x^3 - 8}$$

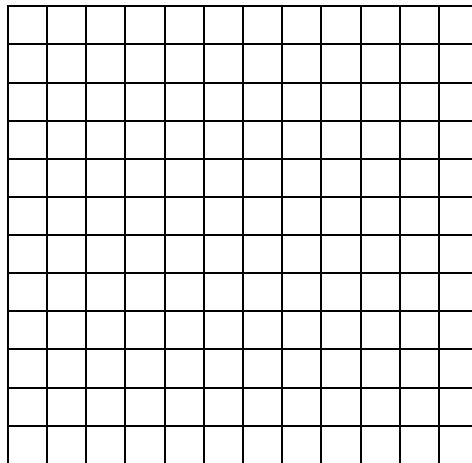


The next graphs have the same x-intercepts, but the vertical asymptotes either go through the x-intercepts or are outside or inside the x-intercepts.

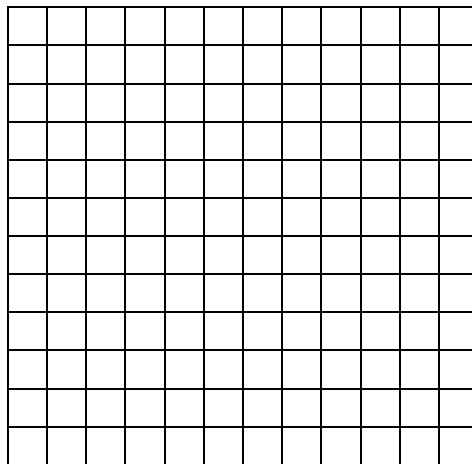
13) $\frac{x^2 + 4x + 3}{x + 1}$



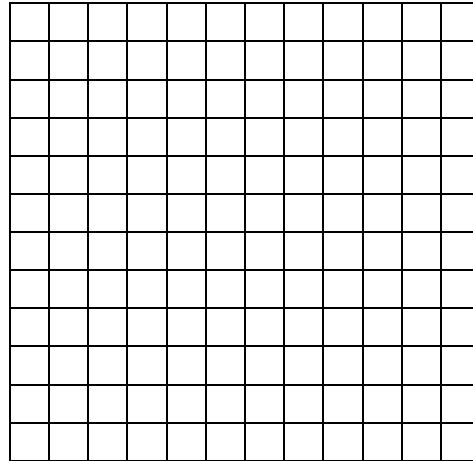
14) $\frac{x^2 + 4x + 3}{x + 3}$



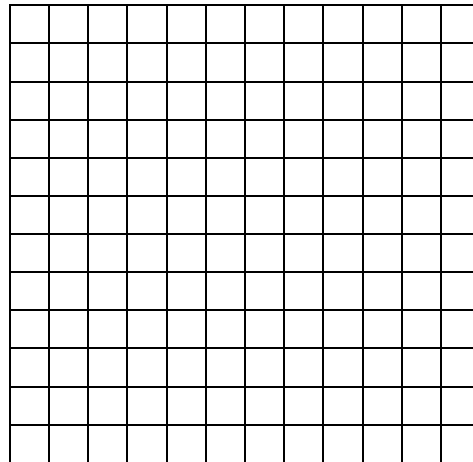
15) $\frac{x^2 + 4x + 3}{x + 2}$



16) $\frac{x^2 + 4x + 3}{x - 1}$



17) $\frac{x^2 + 4x + 3}{x}$



18) $\frac{x^2 + 4x + 3}{x + 4}$

