

Graphs of Reciprocal Functions

The function $g(x)$ has a reciprocal function $f(x) = \frac{1}{g(x)}$

We shall limit $g(x)$ to polynomial functions for this unit.

(1) Do the "INVESTIGATE the Math" on p.248, parts F to H

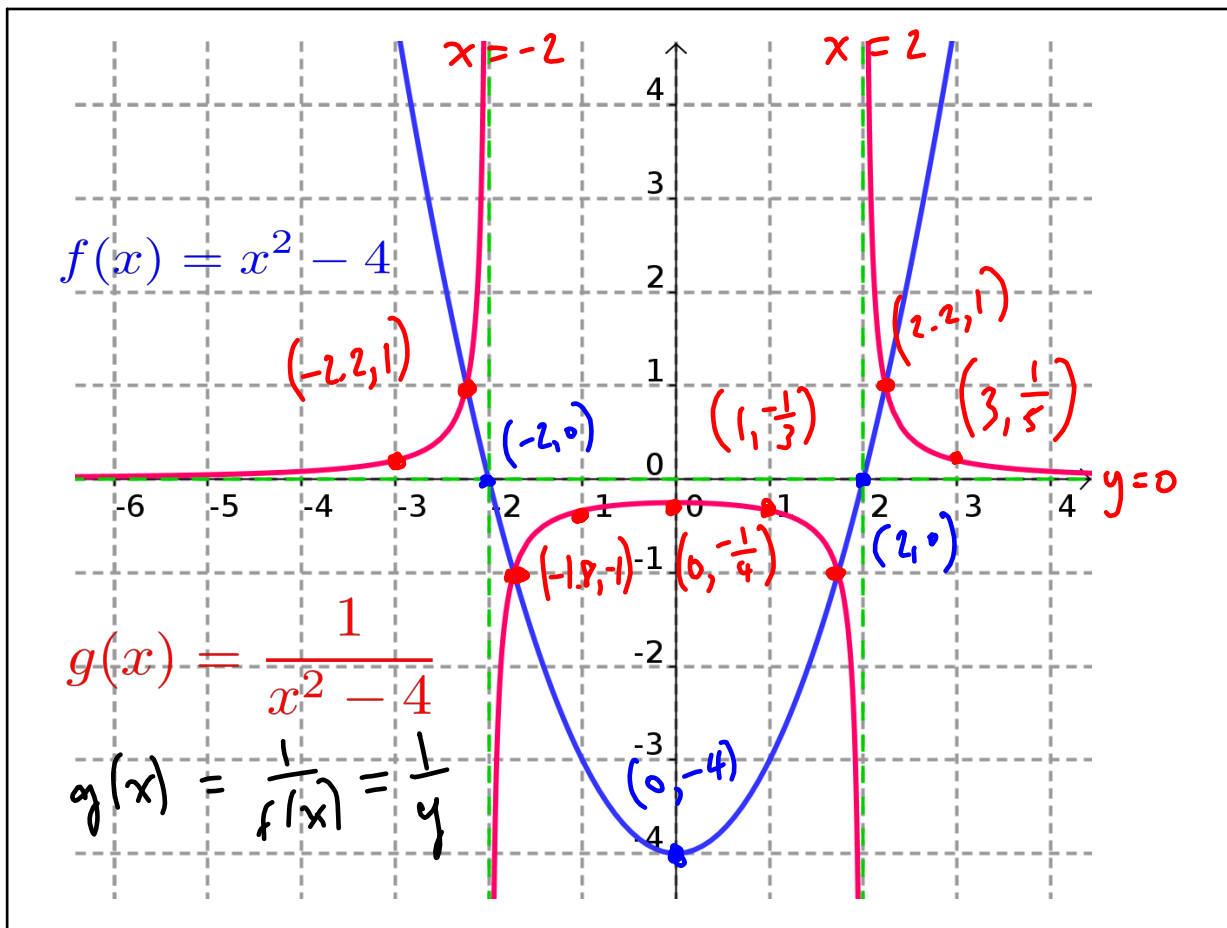
- graph paper will be provided
- use graphing technology to verify results

$$f(x) = x^2 - 4 \quad g(x) = \frac{1}{x^2 - 4}$$

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characteristics	$f(x) = x^2 - 4$	$g(x) = \frac{1}{x^2 - 4}$
intercepts & asymptotes		
positive intervals		
negative intervals		
increasing intervals		
decreasing intervals		
points where $y = 1$		
points where $y = -1$		

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characteristics	$f(x) = x^2 - 4$	$g(x) = \frac{1}{x^2 - 4}$
intercepts & asymptotes	$x: (-2, 0), (2, 0)$ $y: (0, -4)$	VA: $x = -2, x = 2$ $y: (0, -\frac{1}{4})$ HA: $y = 0$
positive intervals	$(-\infty, -2), (2, \infty)$	$(-\infty, -2), (2, \infty)$
negative intervals	$x \in (-2, 2)$	$x \in (-2, 2)$
increasing intervals	$(0, \infty)$	$(-\infty, -2), (2, 0)$
decreasing intervals	$(-\infty, 0)$	$(0, 2), (2, \infty)$
points where $y = 1$	$(-2.2, 1), (2.2, 1)$	same
points where $y = -1$	$(-1.8, -1), (1.8, -1)$	same

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Summary:

(a) any point $\left(x, \frac{a}{b}\right)$ becomes $\left(x, \frac{b}{a}\right)$

$$f(x) = \frac{1}{g(x)}$$

(b) zeroes become vertical asymptotes

(c) reciprocals of linear or quadratic will have a horizontal asymptote at $y = 0$

(d) the original and reciprocal will be positive and negative on the same intervals

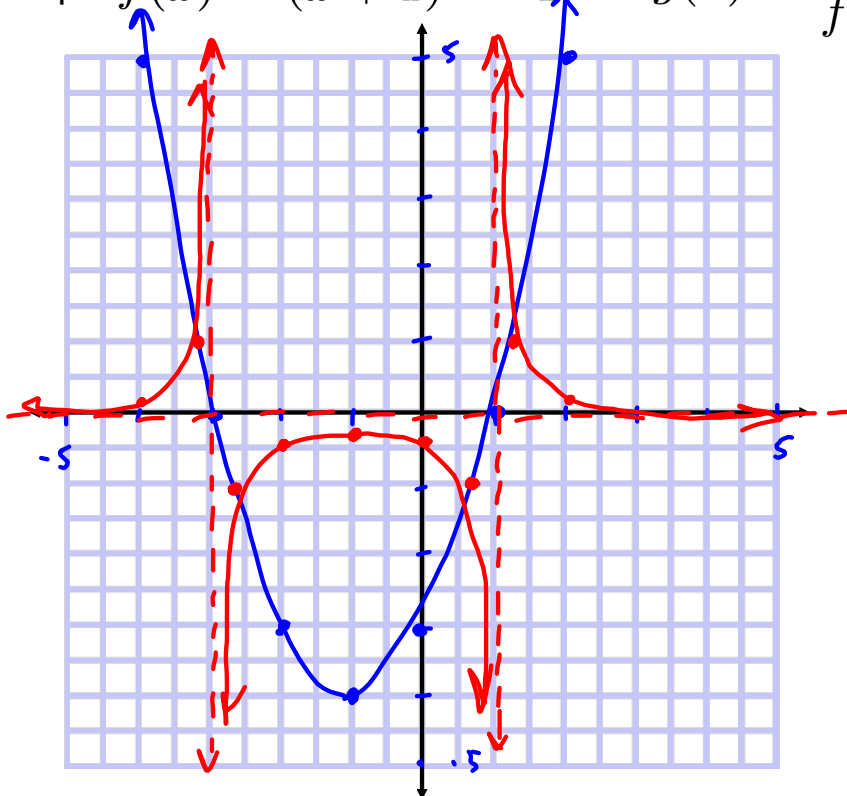
(e) intervals of increase/decrease are reversed on reciprocal

(f) any local max/min points become local min/max points (they are reversed)

(g) any point on the original function with a y-value of 1 or -1 will intersect the reciprocal at that point

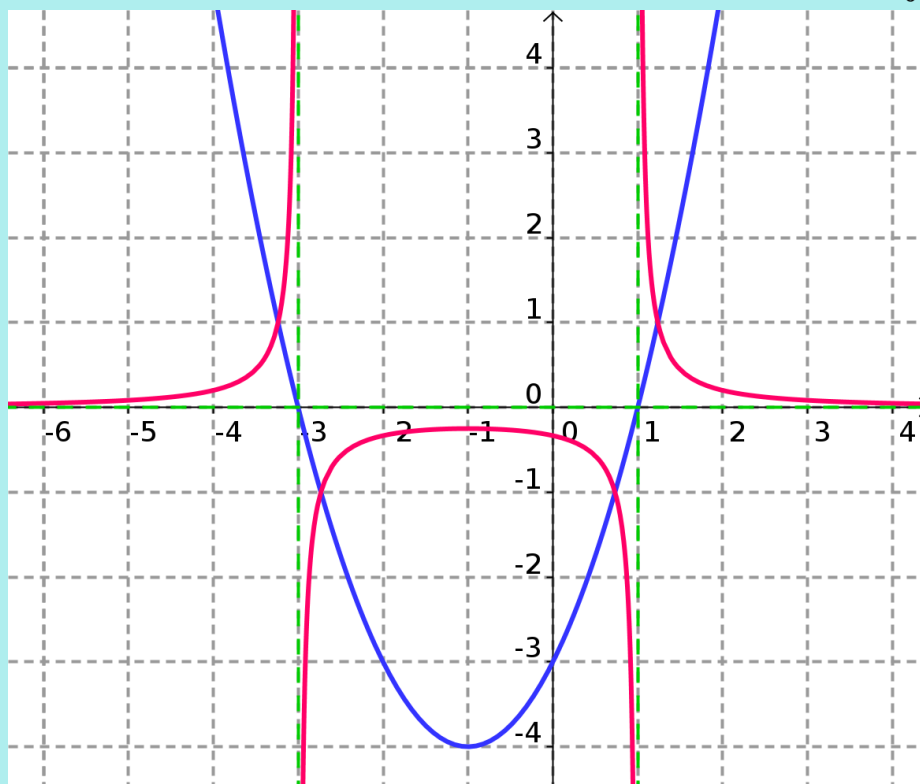
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Ex.1 Graph $f(x) = (x + 1)^2 - 4$ and $g(x) = \frac{1}{f(x)}$



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Assigned Work:

p.254 # 1, 2def, 6bcd, 8bdf, 9bc, 11

16 (find equation of reciprocal (shown) and original function)

$$f(x) = \frac{1}{g(x)}$$

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