Pre-Calculus 11
Chapter 7: Absolute Value and Reciprocal Functions

7.4 Reciprocal Function (Part One: Linear)

Recall from last day that the reciprocal of a function $y=f(x)$ is $y=\frac{1}{f(x)}$, $f(x)\neq 0$.

For example, the reciprocal of the function $y=x+5$ is $y=\frac{1}{x+5}$, $x\neq -5$

Today, we will focus specifically on linear reciprocal functions.

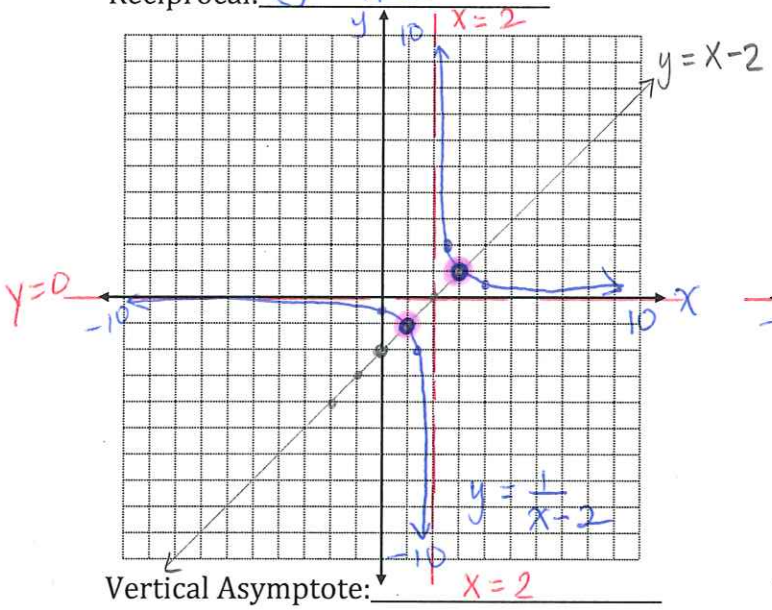
Example: Graph each function and its reciprocal. For each reciprocal function, label any asymptotes, invariant points, and intercepts.

Asymptote: a line whose distance from a given curve approaches zero.

Invariant point: a point that remains unchanged after a given transformation.

a) $y=x-2$

Reciprocal: $y=\frac{1}{x-2}$



Vertical Asymptote: $x=2$

Horizontal Asymptote: $y=0$

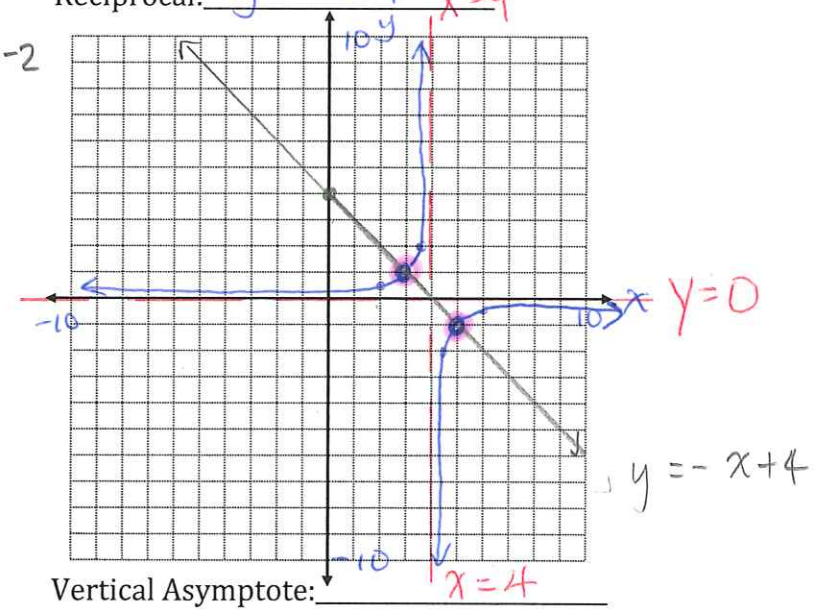
Invariant Points: (3, 1) and (1, -1)

x-intercept: none

y-intercept: $(0, \frac{1}{2})$

b) $y=-x+4$

Reciprocal: $y=\frac{1}{-x+4}$



Vertical Asymptote: $x=4$

Horizontal Asymptote: $y=0$

Invariant Points: (3, 1) and (5, -1)

x-intercept: none

y-intercept: $(0, \frac{1}{4})$

Example: For each function:

i) Determine the zero (x–intercept).

ii) State the equation of the reciprocal function, its non-permissible values, and its asymptotes.

iii) Graph the original and the reciprocal function.

a) $y = x + 5$

i) zero is when $y = 0$

$0 = x + 5$

$x = -5$

ii) reciprocal: $y = \frac{1}{x+5}$

$x \neq -5$

vertical asymptote: $x = -5$

horizontal asymptote: $y = 0$

b) $y = -2x - 6$

i) zero: $0 = -2x - 6$

$-2x = 6$

$x = -3$

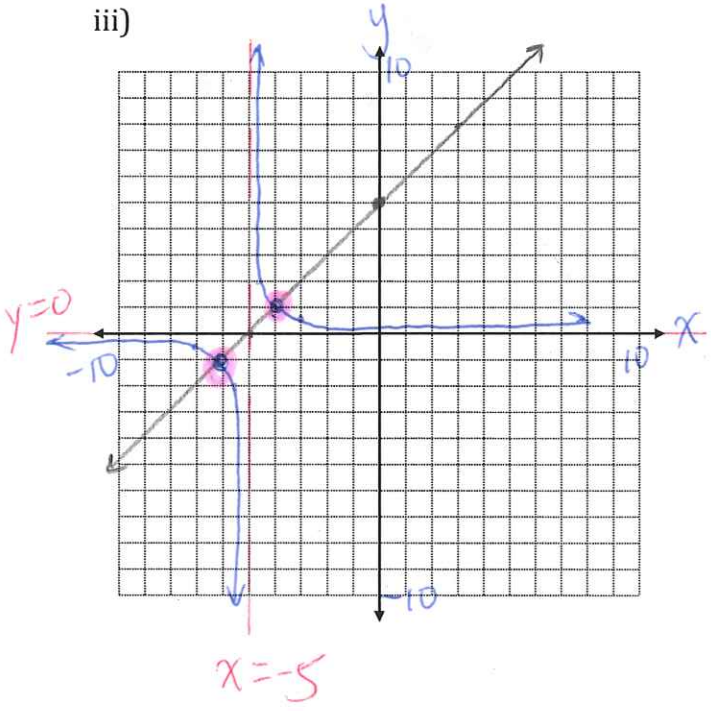
ii) reciprocal: $y = \frac{1}{-2x-6}$

$x \neq -3$

vertical asymptote: $x = -3$

horizontal asymptote: $y = 0$

iii)



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