Section 8.2: The Reciprocal Function

Functions that model inverse variation, \( y = \frac{k}{x} \), belong to a family of functions, called the reciprocal function \( f(x) = \frac{1}{x} \).

Graphing the reciprocal function...

Graph the following function, using transformations of the parent reciprocal function. Be sure to state the domain and range of each graph as well.
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Graph the following function, using transformations of the parent reciprocal function. Be sure to state the domain and range of each graph as well.

\[ y = \frac{1}{x + 2} - 5 \]

```
\begin{array}{c|c|c}
 x & y & \text{domain} \\
-3 & -\infty & (\infty, 0) \cup (0, \infty) \\
-2 & \text{undefined} & \\
-1 & -4 & \\
\end{array}
```

\[ y \neq 5 \]

```
\begin{array}{c|c|c}
 x & y & \text{domain} \\
-\infty & -5 & (-\infty, -2) \cup (-2, \infty) \\
\end{array}
```
Graph the following function, using transformations of the parent reciprocal function. Be sure to state the domain and range of each graph as well.

\[ y = \frac{5}{x} \]

- Vertical Asymptote: \( x = 0 \)
- Horizontal Asymptote: \( y = 0 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>-5</td>
</tr>
<tr>
<td>0</td>
<td>undefined</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
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</tbody>
</table>

\( x \neq 0 \)

Graph the following function, using transformations of the parent reciprocal function. Be sure to state the domain and range of each graph as well.

\[ y = \frac{-1}{x} + 0 \]

- Vertical Asymptote: \( x = 0 \)
- Horizontal Asymptote: \( y = 0 \)

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\( x \neq 0 \)
Graph the following function, using transformations of the parent reciprocal function. Be sure to state the domain and range of each graph as well.

\[ y = \frac{3}{x+1} + 2 \]

Write an equation for the translation of that has the given asymptotes.

- \( x = 4 \) and \( y = 2 \)
  \[ y = \frac{3}{x-4} + 2 \]

- \( x = -3 \) and \( y = 5 \)
  \[ y = \frac{3}{x+3} + 5 \]

- \( x = 3 \) and \( y = -1 \)
  \[ y = \frac{3}{x-3} - 1 \]
Write the function rule for each of the given graphs.

\[ y = \frac{k}{x+3} + 4 \]

(1) \( y = \frac{2}{x+3} + 4 \)

(2) \( y = \frac{3}{x} + 4 \)

(3) \( y = \frac{k}{4} + 4 \)

(4) \( y = \frac{2}{3} + 4 \)

(5) \( k = \frac{2}{3} \)