7.4 Graphing Logarithmic Functions

Since logarithmic functions are inverses of exponential functions, their graphs are reflections of each other over $y = x$.

Parent Graphs for Logarithmic Functions

\[ f(x) = \log_b x \text{ for } b > 1 \]

\[ f(x) = \log_b x \text{ for } 0 < b < 1 \]

Vertical Asymptote:
Domain:
Range:

Graph Functions: $y = \log_b x$

a. $y = \log_3 x$

1. Rewrite

2. Table (Choose y’s)

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. $y = \log_{\frac{1}{2}} x$

1. Rewrite

2. Table (Choose y’s)

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Graph Functions: $y = \log_b(x - h) + k$

$h$: Horizontal Translation  $k$: Vertical Translation

$h$: + $h$:  
$h$: - $h$:  

$k$: + $k$:  
$k$: - $k$:  

Steps:
1. Graph parent function $y = \log_b x$
2. Translate points left or right $h$, then up or down $k$.
3. Connect in smooth curve

c. $y = \log_2(x + 3) + 1$

d. $y = \log_3(x - 2) - 4$

e. $y = \log_1(x - 3)$