

## Math 241 – Limit laws with infinite limits

Spring 2018

Below is a tabular display of the limit laws when infinity is involved. Perhaps the most important thing to notice about this table is all the **MW!**s. These represent cases where the limit law doesn't tell you anything, and you need to do . . . **More Work!** In such cases, you need to either factor, rationalize, rearrange the limit, or . . .

In the table,  $x_0$  is a real number or  $\pm\infty$ ,  $b > 0$  is a positive real number, and  $f(x)$  and  $g(x)$  are two functions whose limit as  $x$  approaches  $x_0$  is given by the first and second columns, respectively. The third through sixth columns tell you what the limit laws say about the limit as  $x$  approaches  $x_0$  of the function in the first row. A <sup>bit</sup><sub>mw</sub> means that the limit law tells you the limit does not exist, but it may be  $\pm\infty$ . In this case, you need to do a bit more work to figure that out. Note that you can replace  $\lim_{x \rightarrow x_0}$  with  $\lim_{x \rightarrow x_0^-}$  or  $\lim_{x \rightarrow x_0^+}$ .

$\lim_{x \rightarrow x_0} f(x)$	$\lim_{x \rightarrow x_0} g(x)$	$f + g$	$f - g$	$fg$	$f/g$
$\infty$	$\infty$	$\infty$	<b>MW!</b>	$\infty$	<b>MW!</b>
	$-\infty$	<b>MW!</b>	$\infty$	$-\infty$	<b>MW!</b>
	0	$\infty$	$\infty$	<b>MW!</b>	<sup>bit</sup> <sub>mw</sub>
	$\pm b, (with\ b > 0)$	$\infty$	$\infty$	$\pm\infty$	$\pm\infty$
$-\infty$	$\infty$	<b>MW!</b>	$-\infty$	$-\infty$	<b>MW!</b>
	$-\infty$	$-\infty$	<b>MW!</b>	$\infty$	<b>MW!</b>
	0	$-\infty$	$-\infty$	<b>MW!</b>	<sup>bit</sup> <sub>mw</sub>
	$\pm b, (with\ b > 0)$	$-\infty$	$-\infty$	$\mp\infty$	$\mp\infty$
0	$\infty$	$\infty$	$-\infty$	<b>MW!</b>	0
	$-\infty$	$-\infty$	$\infty$	<b>MW!</b>	0
	0	0	0	0	<b>MW!</b>
	$\pm b, (with\ b > 0)$	$\pm b$	$\mp b$	0	0
$\pm b, (with\ b > 0)$	$\infty$	$\infty$	$-\infty$	$\pm\infty$	0
	$-\infty$	$-\infty$	$\infty$	$\mp\infty$	0
	0	$\pm b$	$\pm b$	0	<sup>bit</sup> <sub>mw</sub>