

to compute  $\log x + \log y$  in log-probability world:

if  $\log x = -\text{infinity}$  then output  $\log y$

if  $\log y = -\text{infinity}$  then output  $\log x$

if  $\log x - \log y > 16$  (for floats, 32 double) then output  $\log x$

if  $\log x > \log y$  then output  $\log x + \log (1 + \exp (\log y - \log x))$

if  $\log y - \log x > 16$  (for floats, 32 double) then output  $\log y$

if  $\log y > \log x$  then output  $\log y + \log (1 + \exp (\log x - \log y))$