Exp. Solve the following by Euler's Modified method $\frac{dy}{dx} = f(x,y) = \log(x+y)$, $y(0) = 2$ at $x = 1.2$ and 1.4 with $h = 0.2$.

Solution. Given that $\frac{dy}{dx} = \log(x+y)$

$x = 0.0 \Rightarrow y(0) = 2$ and $h = 0.2$

Then the various calculations are arranged as follows:-

x	$\log(x+y) = \frac{dy}{dx}$	Mean slope	$y + h \cdot$ Mean slope $= y$
0.0	$\log(0+2) = 0.301$	—	$2 + 0.2(.301) = 2.0602$
0.2	$\log(0.2 + 2.0602) = 0.3541$	$\frac{1}{2}(.301 + .3542)$	$2 + 0.2(.3276) = 2.0655$
0.2	$\log(.2 + 2.0655) = 0.3552$	$\frac{1}{2}(.301 + .3552)$	$2 + 0.2(.3281) = 2.0656$
	↓ 0.3552		
0.2	0.3552	—	$2.0656 + 0.2(0.3552) = 2.1366$
0.4	$\log(.4 + 2.1366) = .4042$	$\frac{1}{2}(.3552 + .4042) \Rightarrow 2.0656 + .2(.3797) = 2.1415$	
0.4	$\log(.4 + 2.1415) = .4051$	$\frac{1}{2}(.3552 + .4051)$	$2.0656 + .2(.3801) = 2.1416$
.4	.4051	—	$2.1416 + .2(.4051) = 2.2226$
.6	$\log(.6 + 2.2226) = .4536$	$\frac{1}{2}(.4051 + .4636)$	$2.1416 + .2(.4279) = 2.2272$
.6	$\log(.6 + 2.2272 = .4517$	$\frac{1}{2}(.4051 + .4514)$	$2.1416 + .2(.4282) = 2.2272$
.6	.4514	—	$2.2272 + .2(.4492) = 2.3170$
.8	$\log(.8 + 2.3176) = .4938$	$\frac{1}{2}(.4514 + .4938)$	$2.2272 + .2(.4726) = 2.3217$
.8	$\log(.8 + 2.3217) = .4943$	$\frac{1}{2}(.4514 + .4943)$	$2.2272 + .2(.4727) = 2.3217$
.8	.4943	—	$2.3217 + .2(.4943) = 2.4206$
1.0	$\log(1.0 + 2.4206) = .5341$	$\frac{1}{2}(.4943 + .5341)$	$2.3217 + .2(.5142) = 2.4245$
1.0	$\log(1.0 + 2.4245) = .5346$	$\frac{1}{2}(.4943 + .5346)$	$2.3217 + .2(.5144) = 2.4245$
1.0	.5346	—	$2.4245 + .2(.5346) = 2.5314$
1.2	$\log(1.2 + 2.5314) = .5719$	$\frac{1}{2}(.5346 + .5719)$	$2.4245 + .2(.5532) = 2.5357$
1.2	$\log(1.2 + 2.5357) = .5723$	$\frac{1}{2}(.5346 + .5723)$	$2.4245 + .2(.5534) = 2.5357$

Hence value of $y = 2.5357$ at $x = 1.2$ and we also

x	$\log(x+y) = y'$	mean slope	$y_0 + .2$ (mean slope) $= y$
1.2	.5723	——	$2.5357 + .2(.5723) = 2.6496$
1.4	$\log(1.4 + 2.6496) = .6074$	$\frac{1}{2}(.5723 + .6496)$	$2.5357 + .2(.5890) = 2.6531$
1.4	$\log(1.4 + 2.6531) = .6078$	$\frac{1}{2}(.5723 + .6078)$	$2.5357 + .2(.5900) = 2.6537$

at $x = 1.4$ the value y is 2.6531