Schéma implicite pour l'équation de la chaleur

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Introduction à l'Analyse Numérique
des Equations aux Dérivées Partielles
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CNAM Saint-Denis, ingénieurs en aérodynamique

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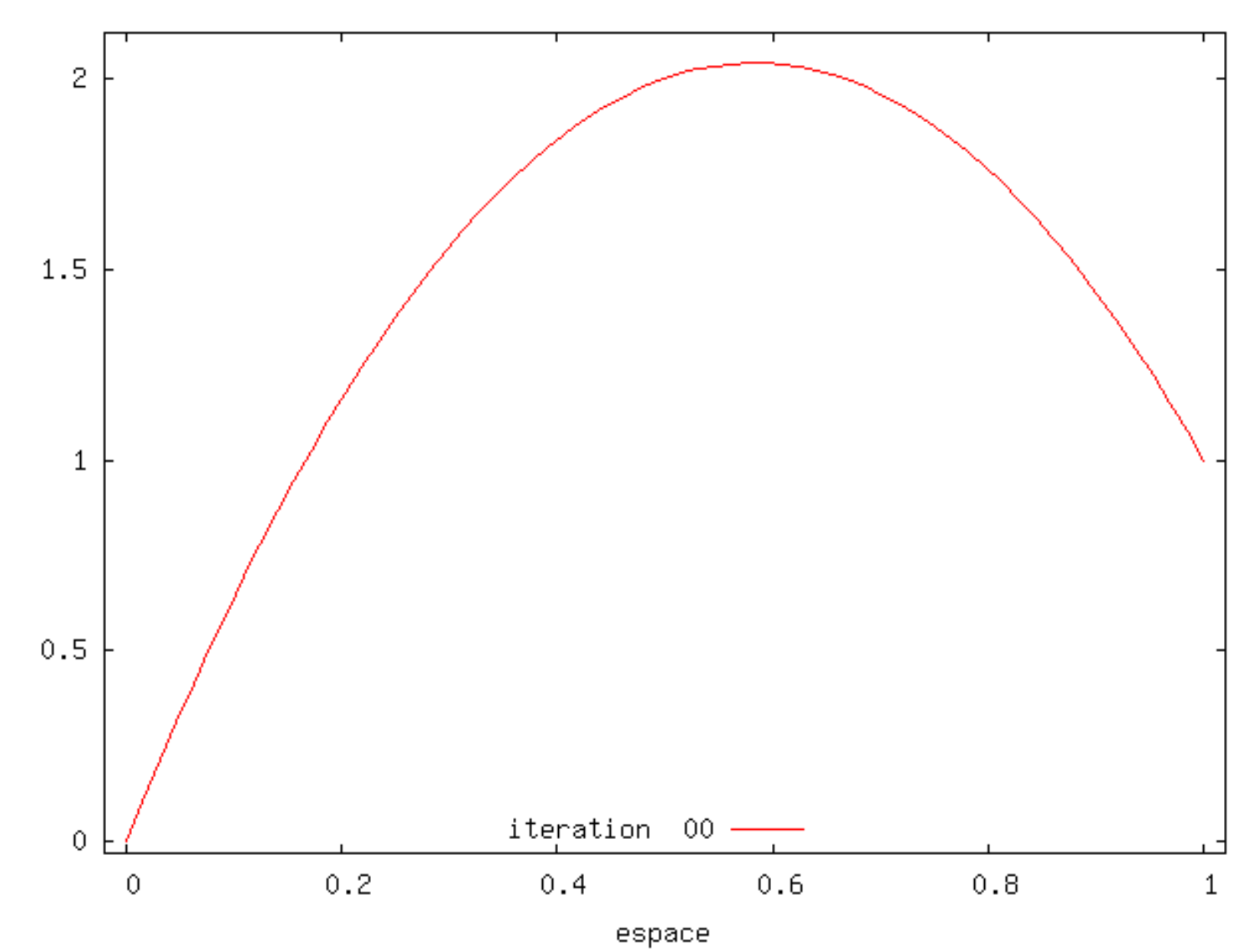
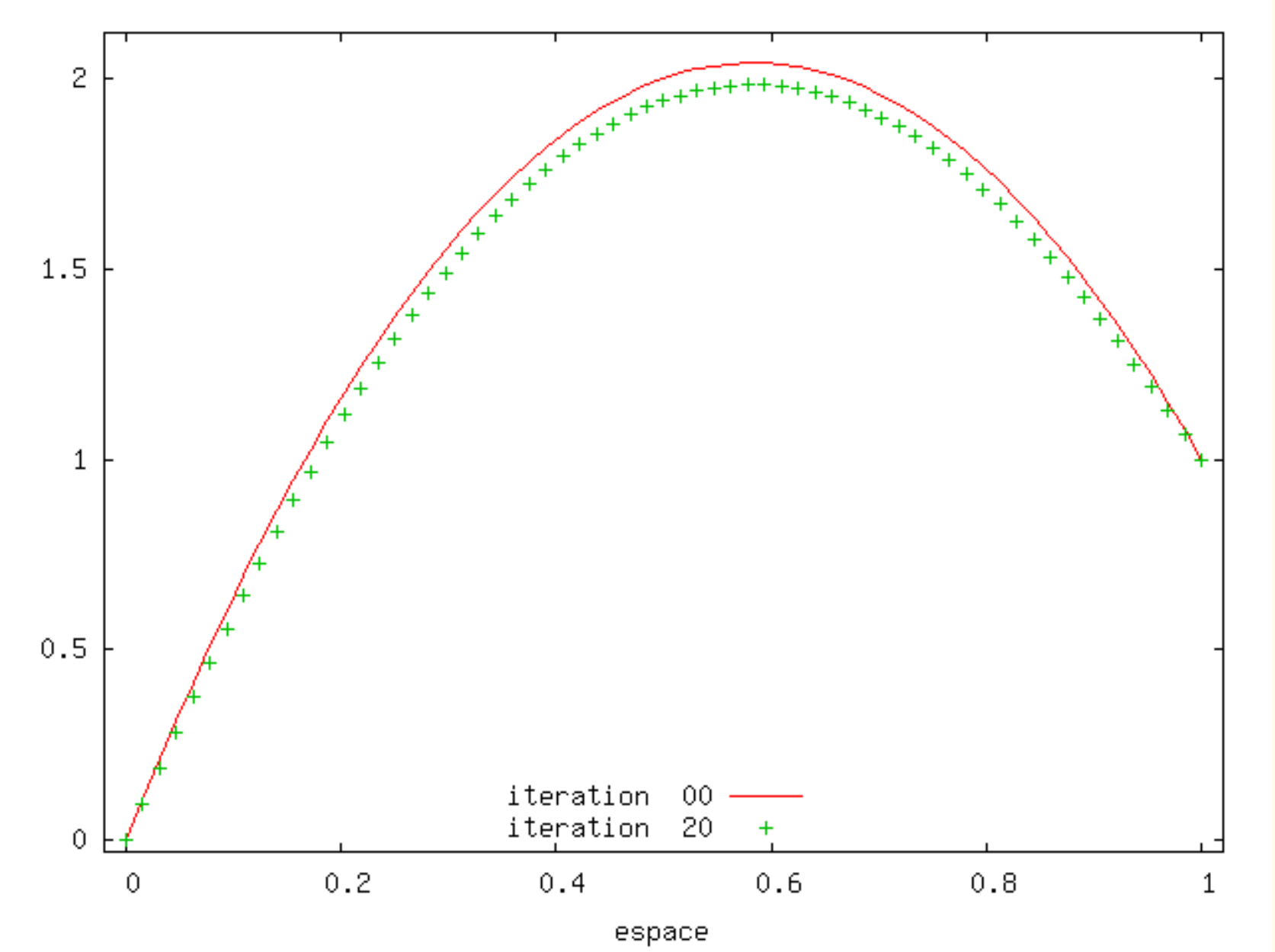
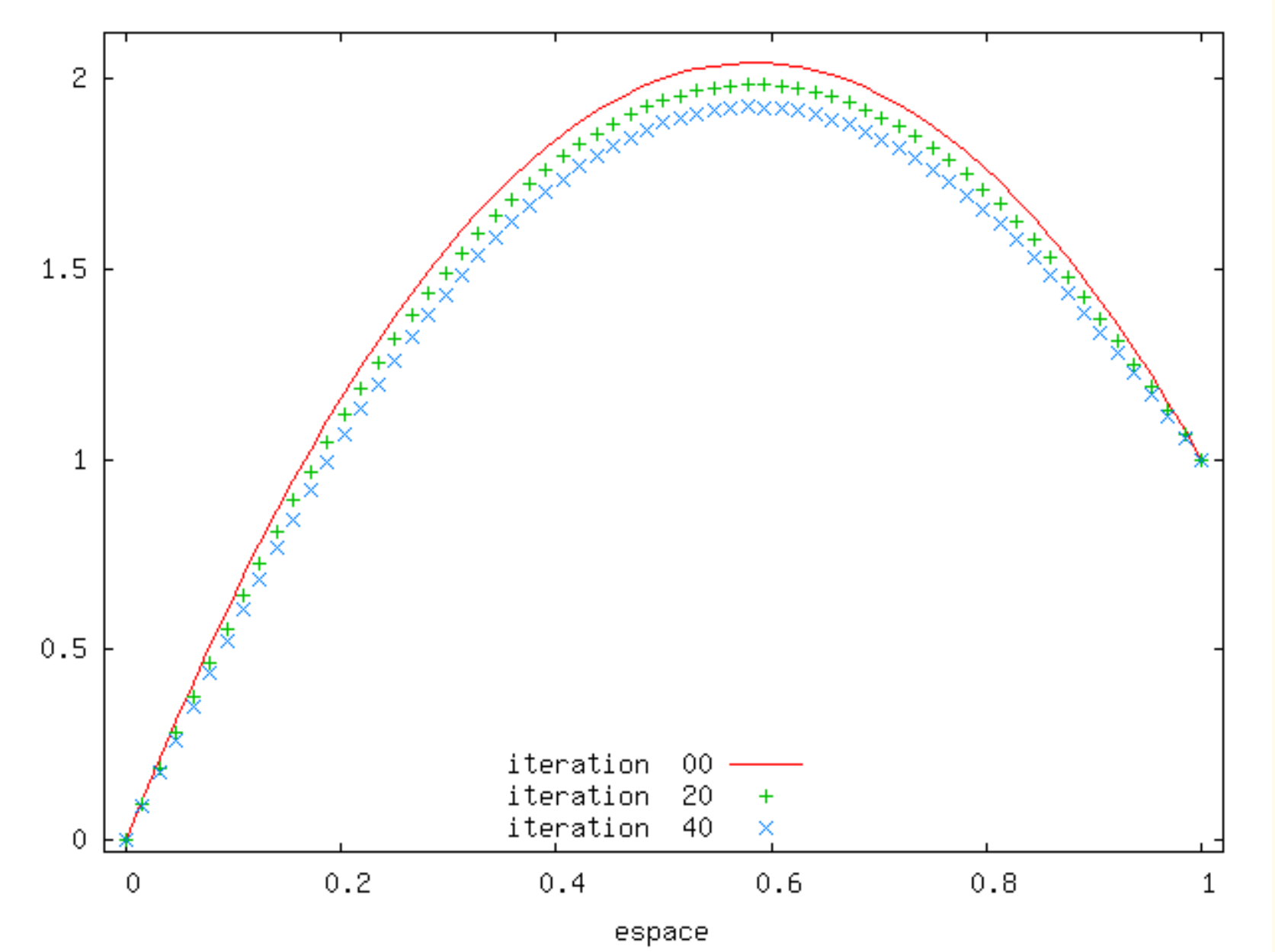
Diffusion, 64 mailles, condition initiale



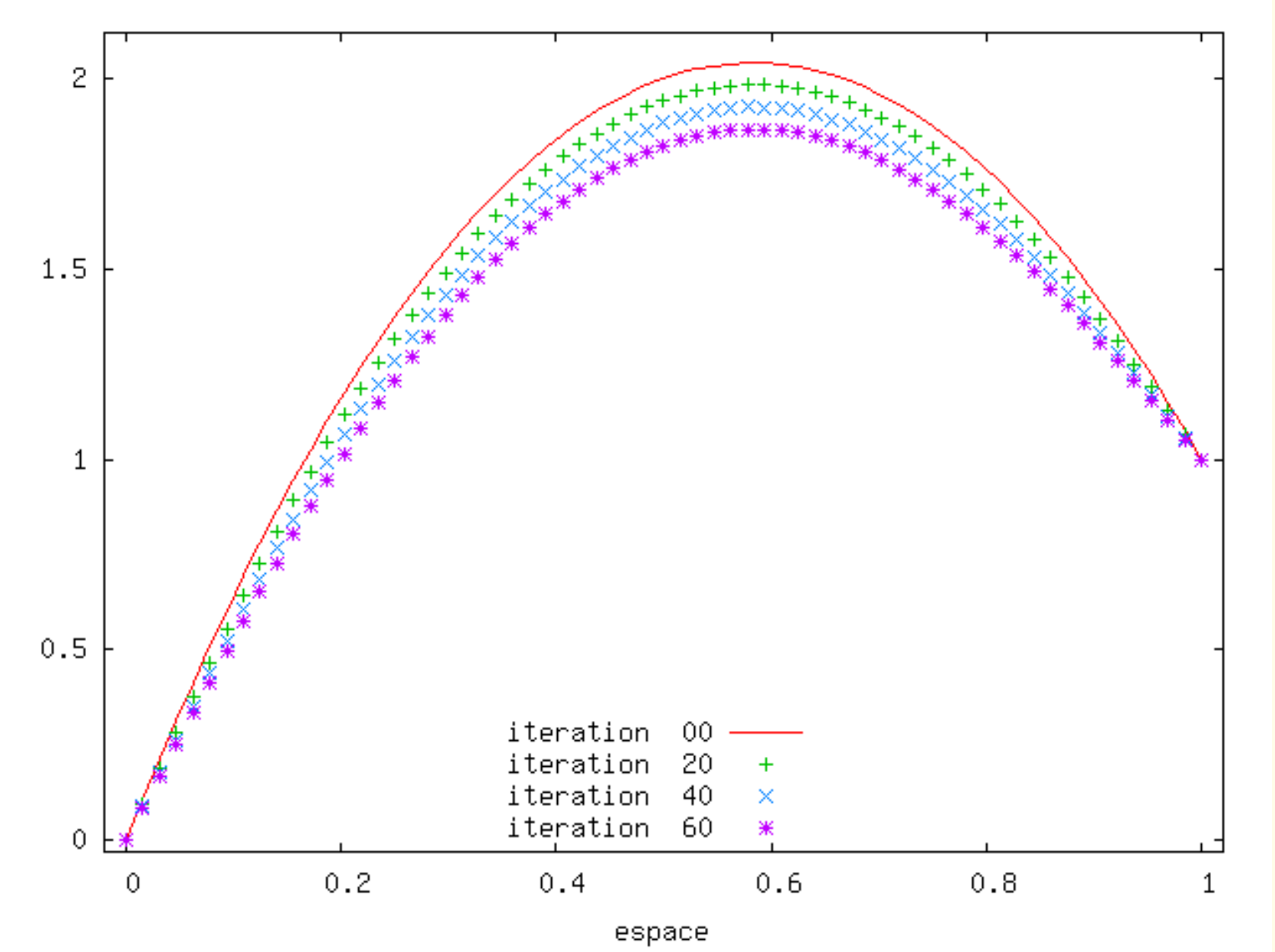
Diffusion, $\zeta = 1$, 64 mailles, iteration 20



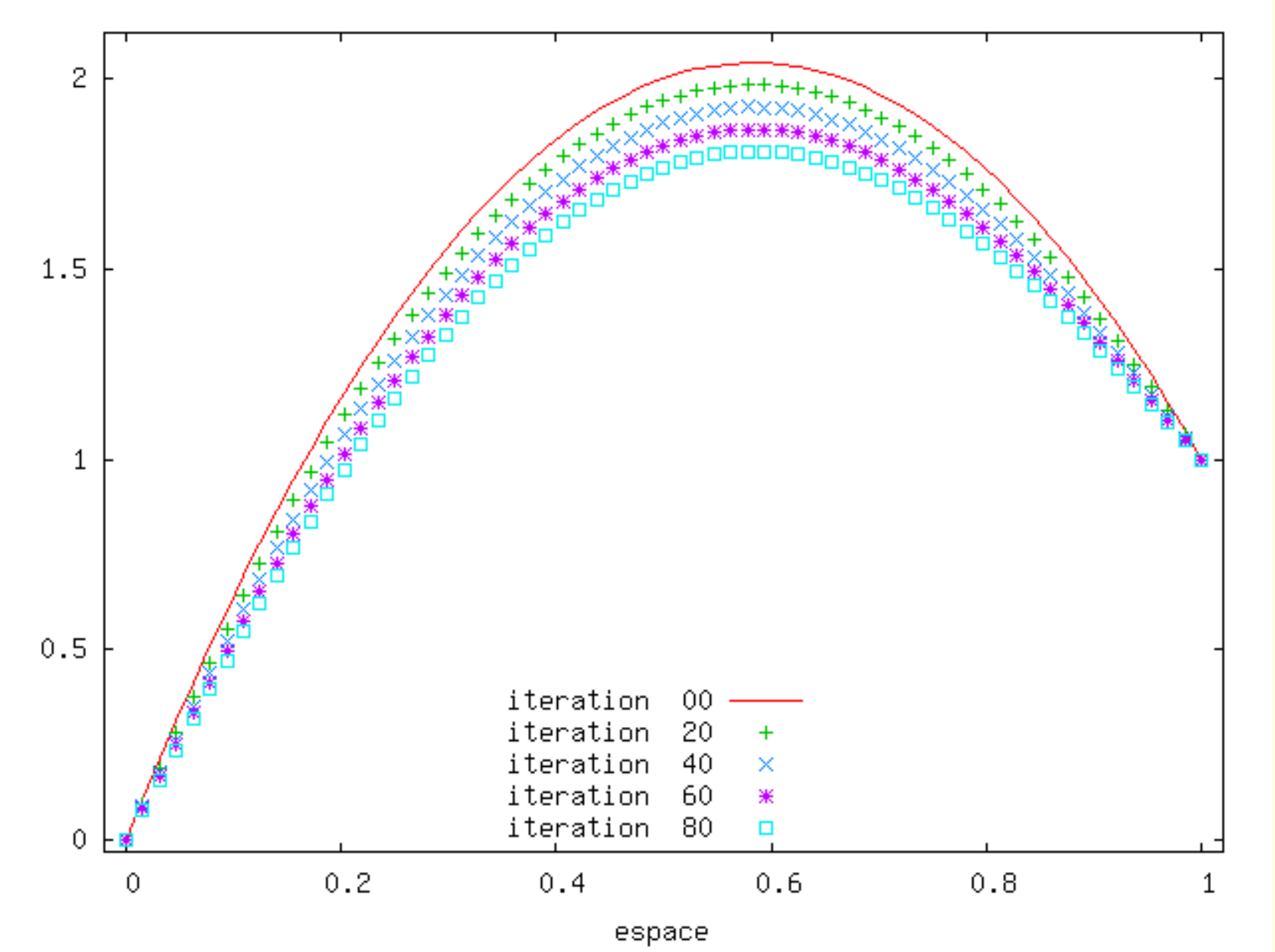
Diffusion, $\zeta = 1$, 64 mailles, iteration 40



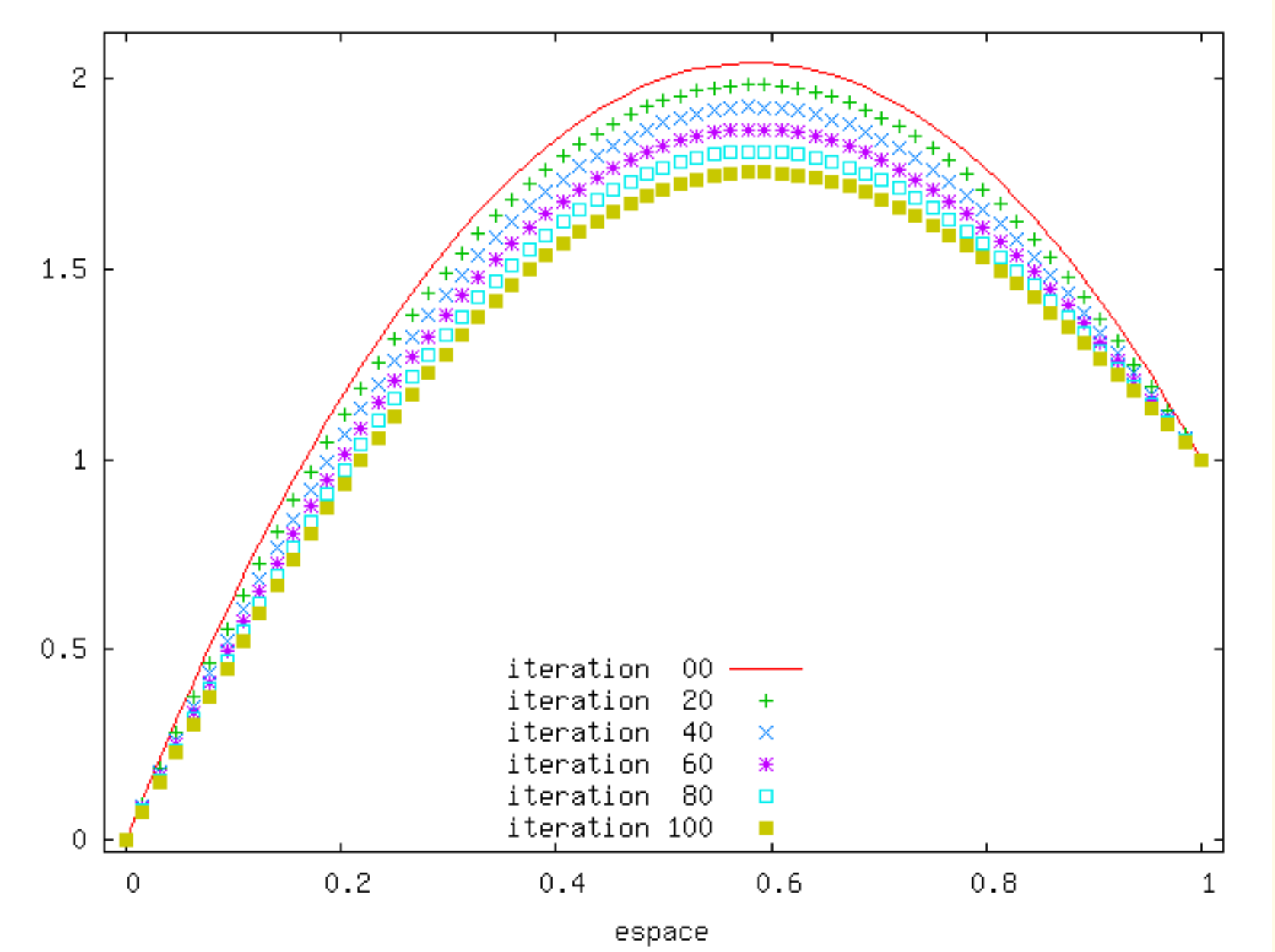
Diffusion, $\zeta = 1$, 64 mailles, iteration 60



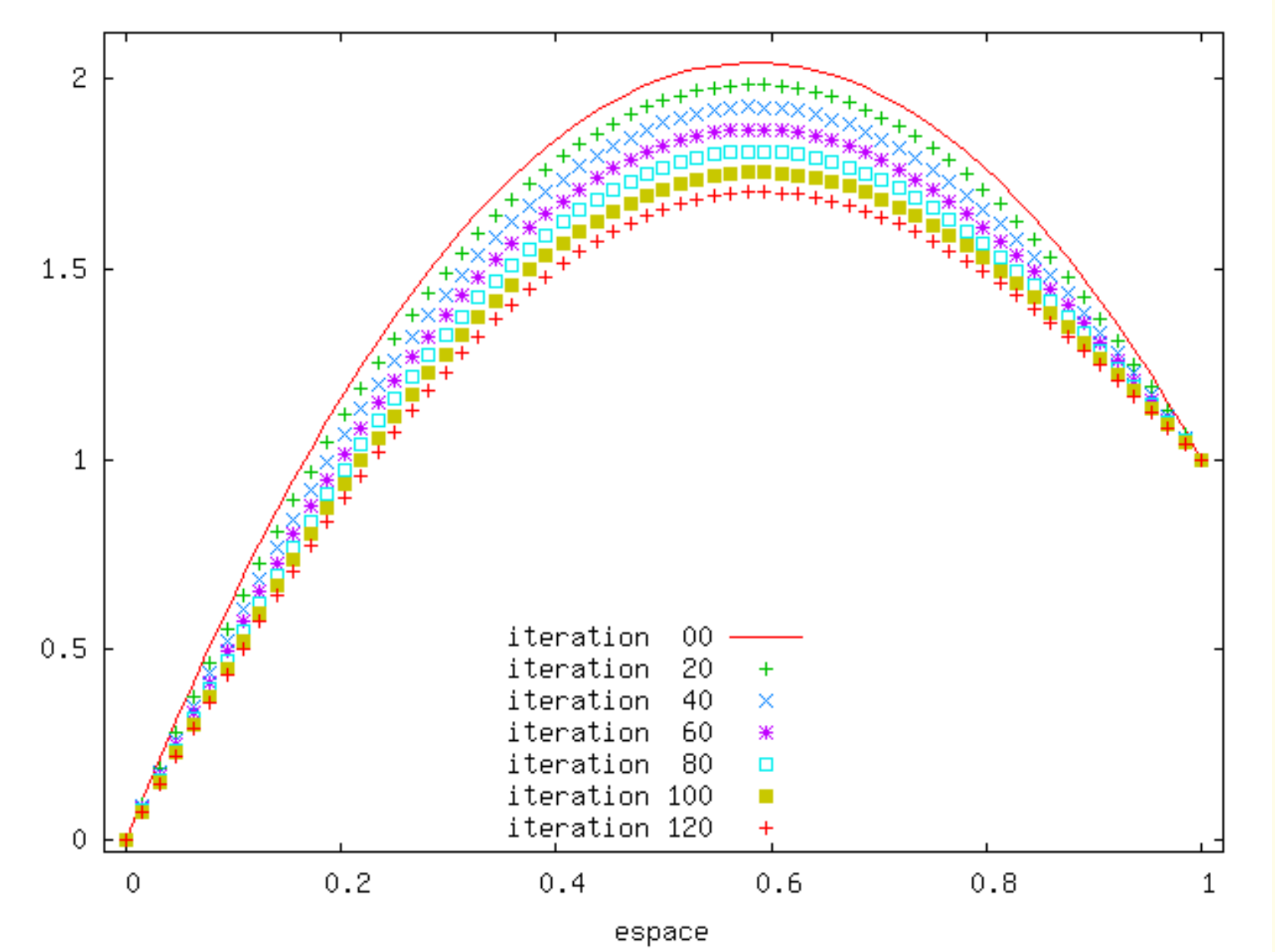
Diffusion, $\zeta = 1$, 64 mailles, iteration 80



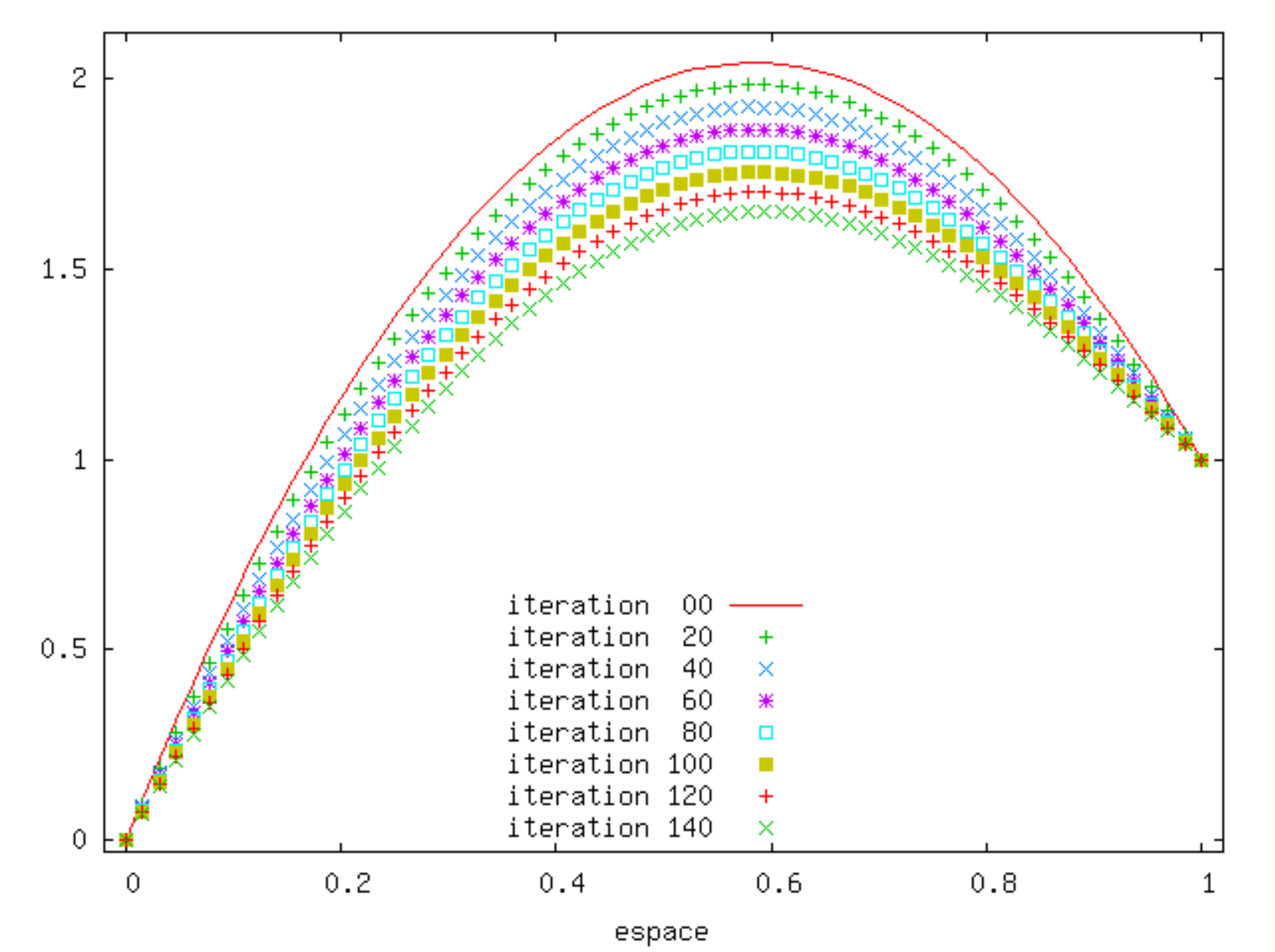
Diffusion, $\zeta = 1$, 64 mailles, iteration 100



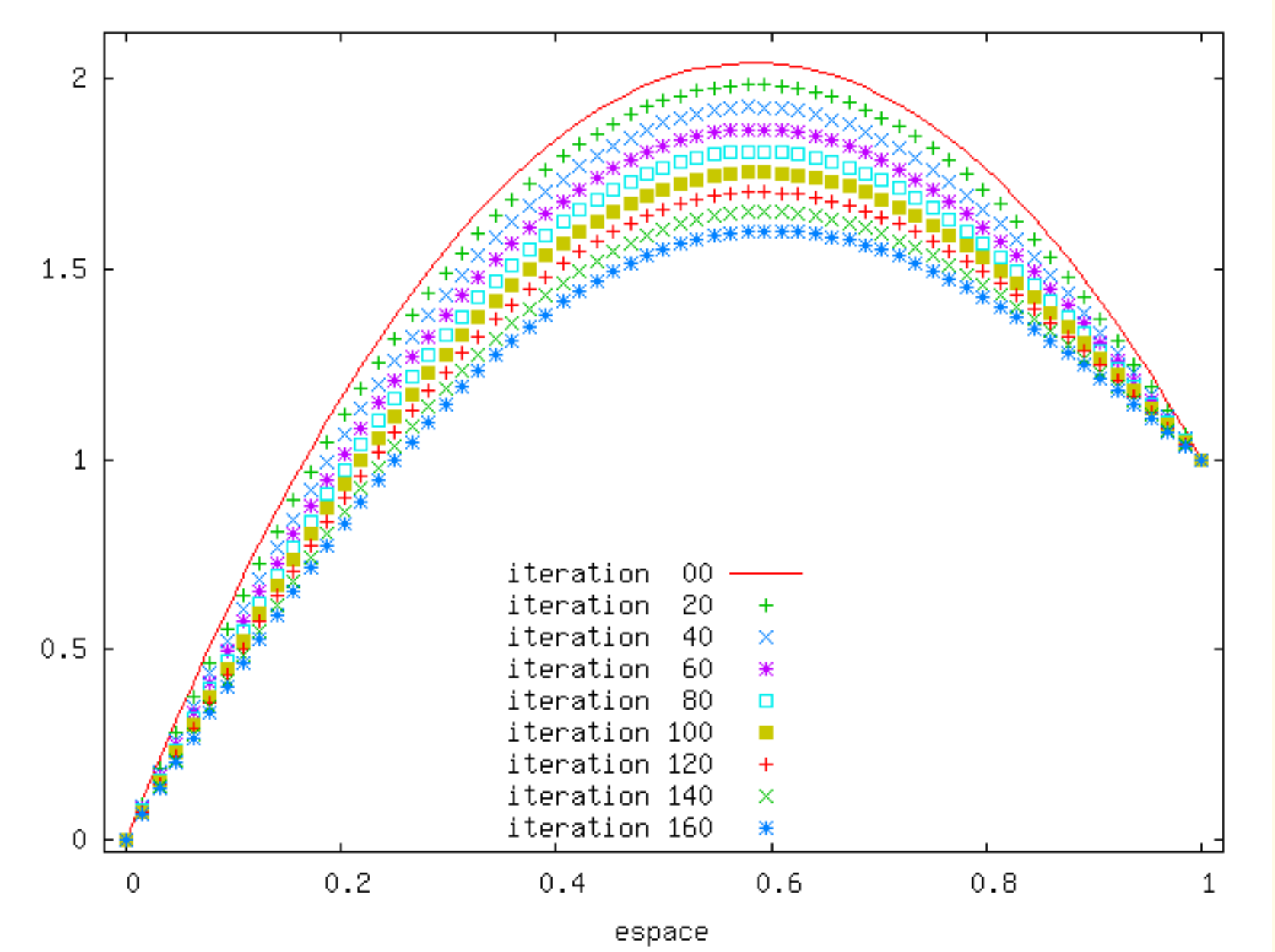
Diffusion, $\zeta = 1$, 64 mailles, iteration 120



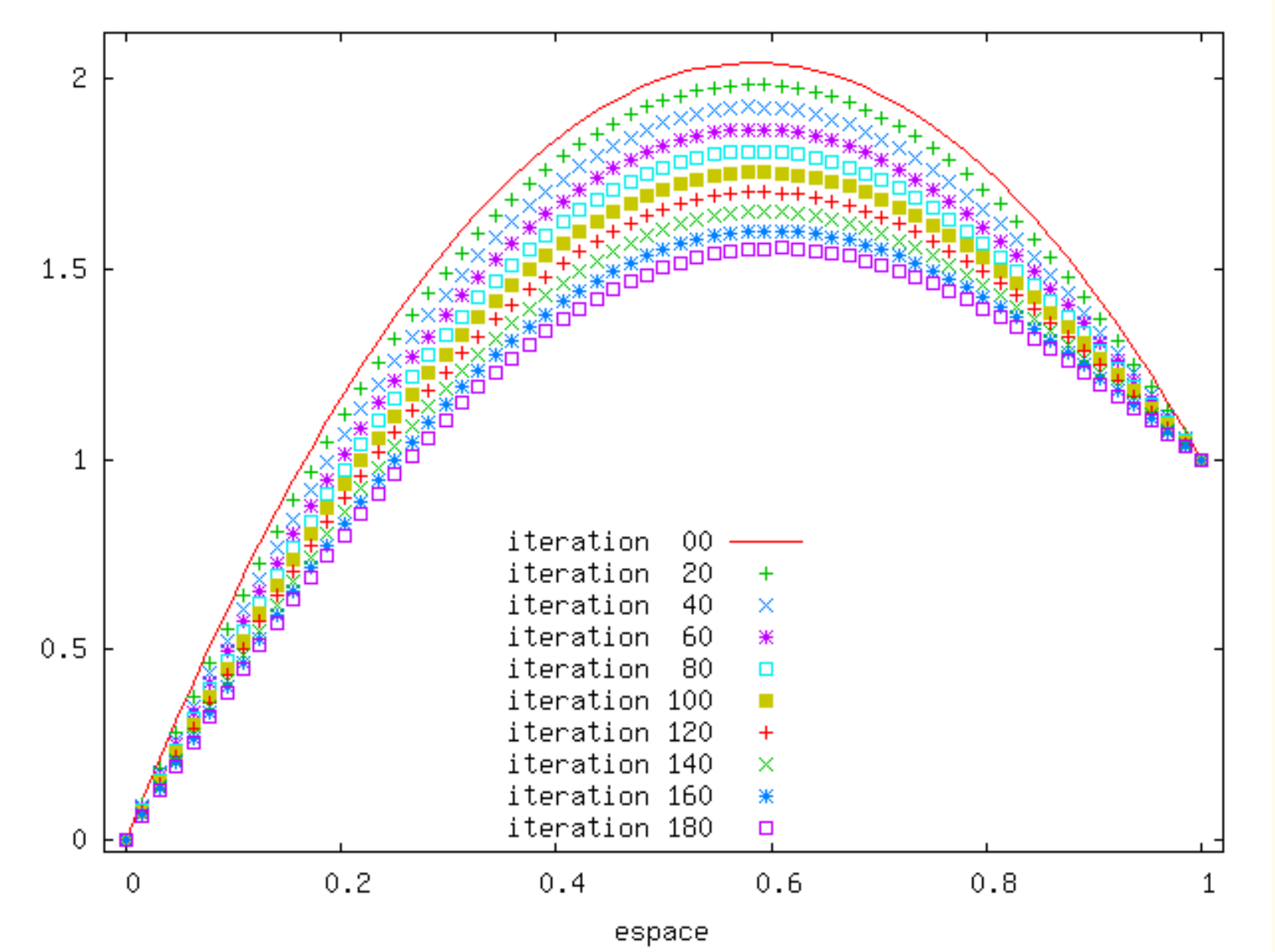
Diffusion, $\zeta = 1$, 64 mailles, iteration 140



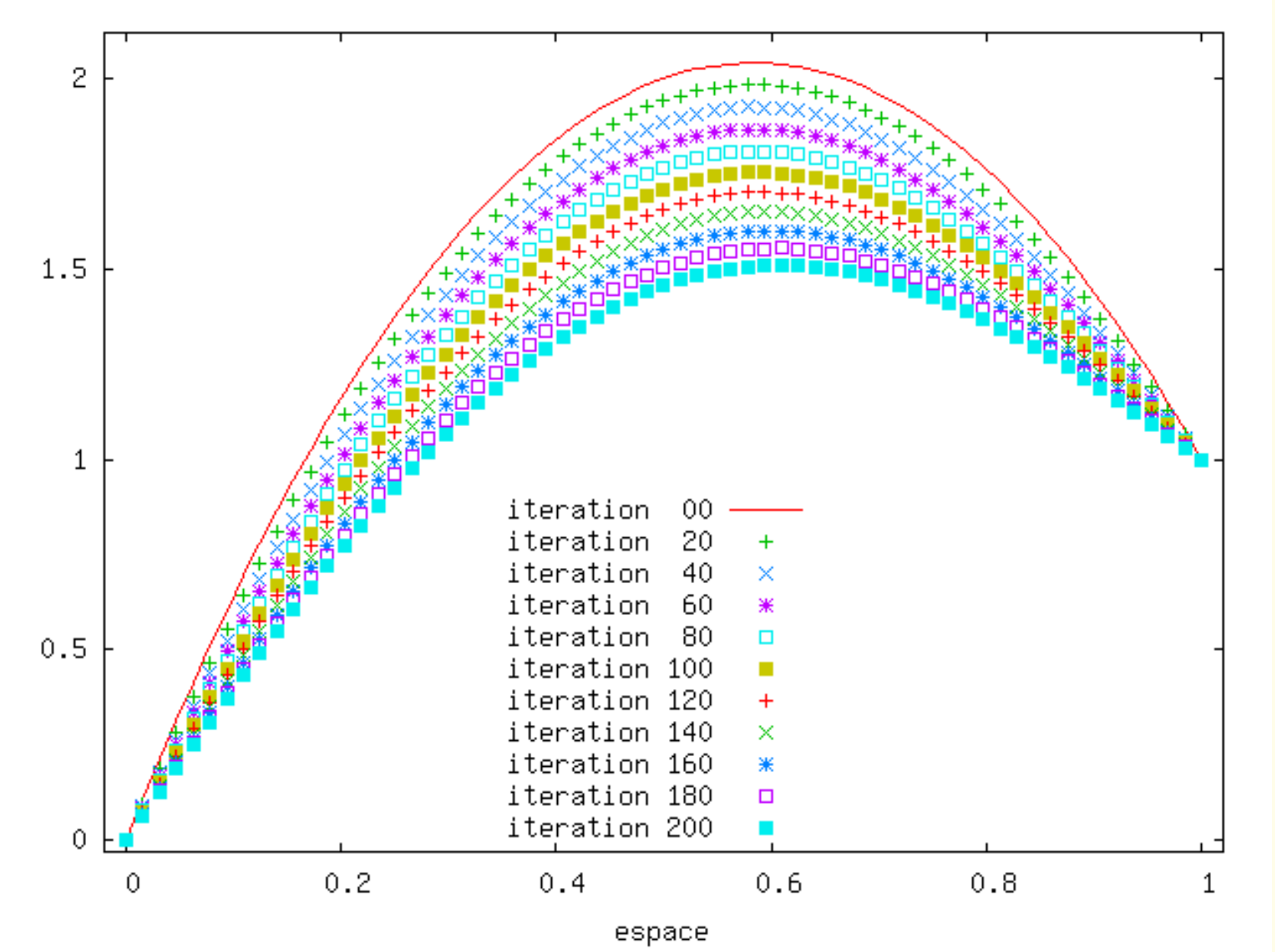
Diffusion, $\zeta = 1$, 64 mailles, iteration 160



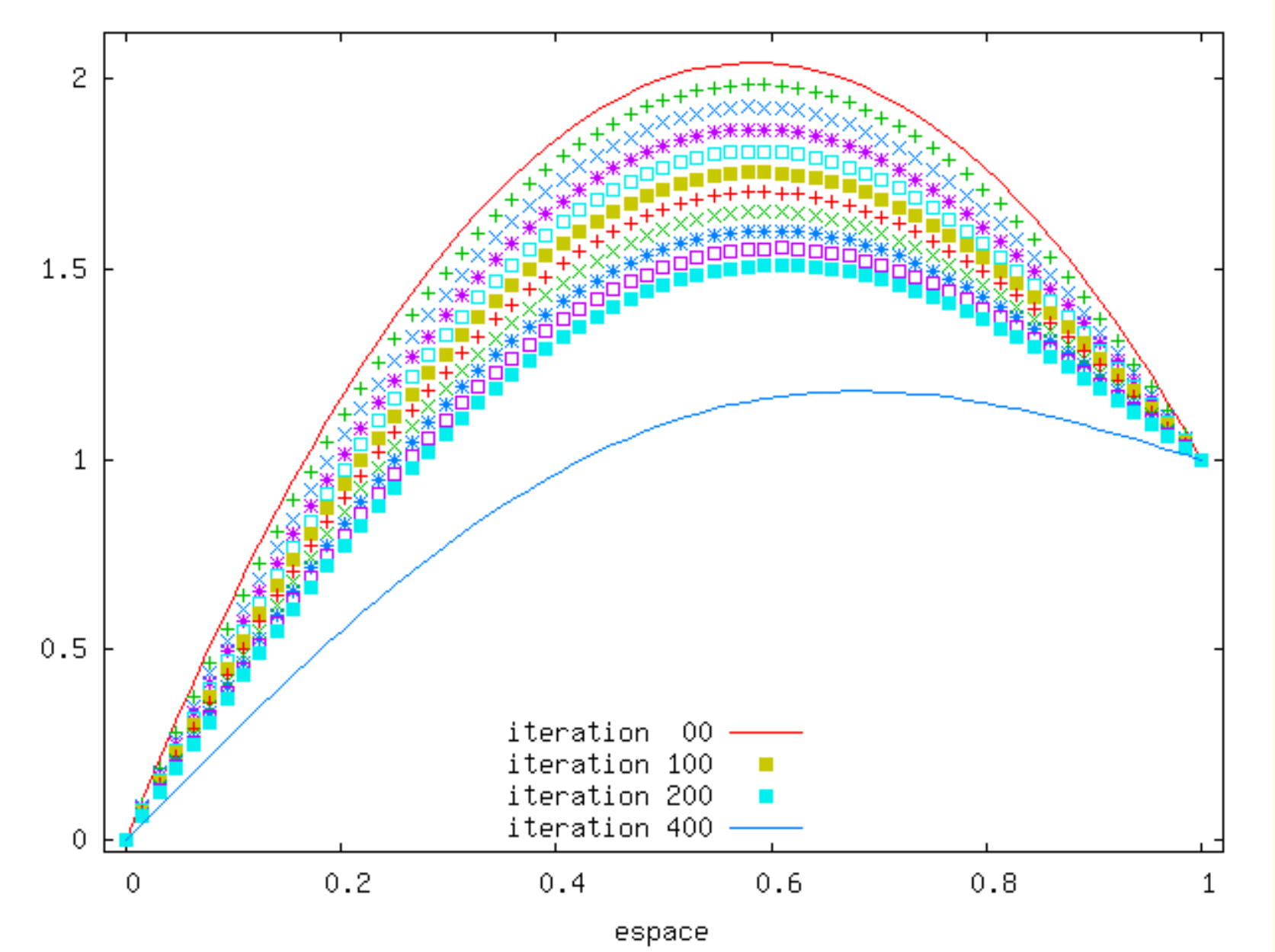
Diffusion, $\zeta = 1$, 64 mailles, iteration 180



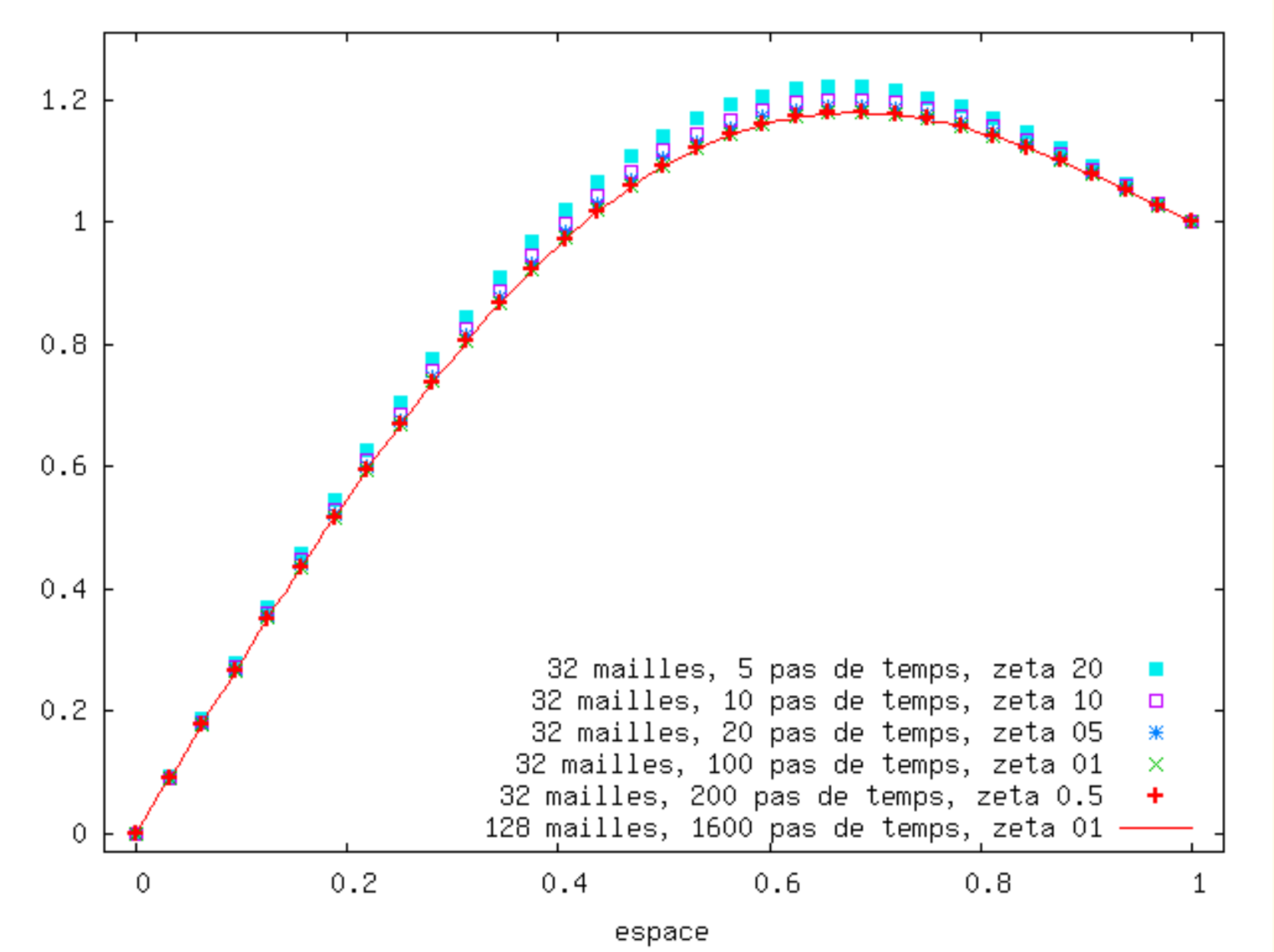
Diffusion, $\zeta = 1$, 64 mailles, iteration 200



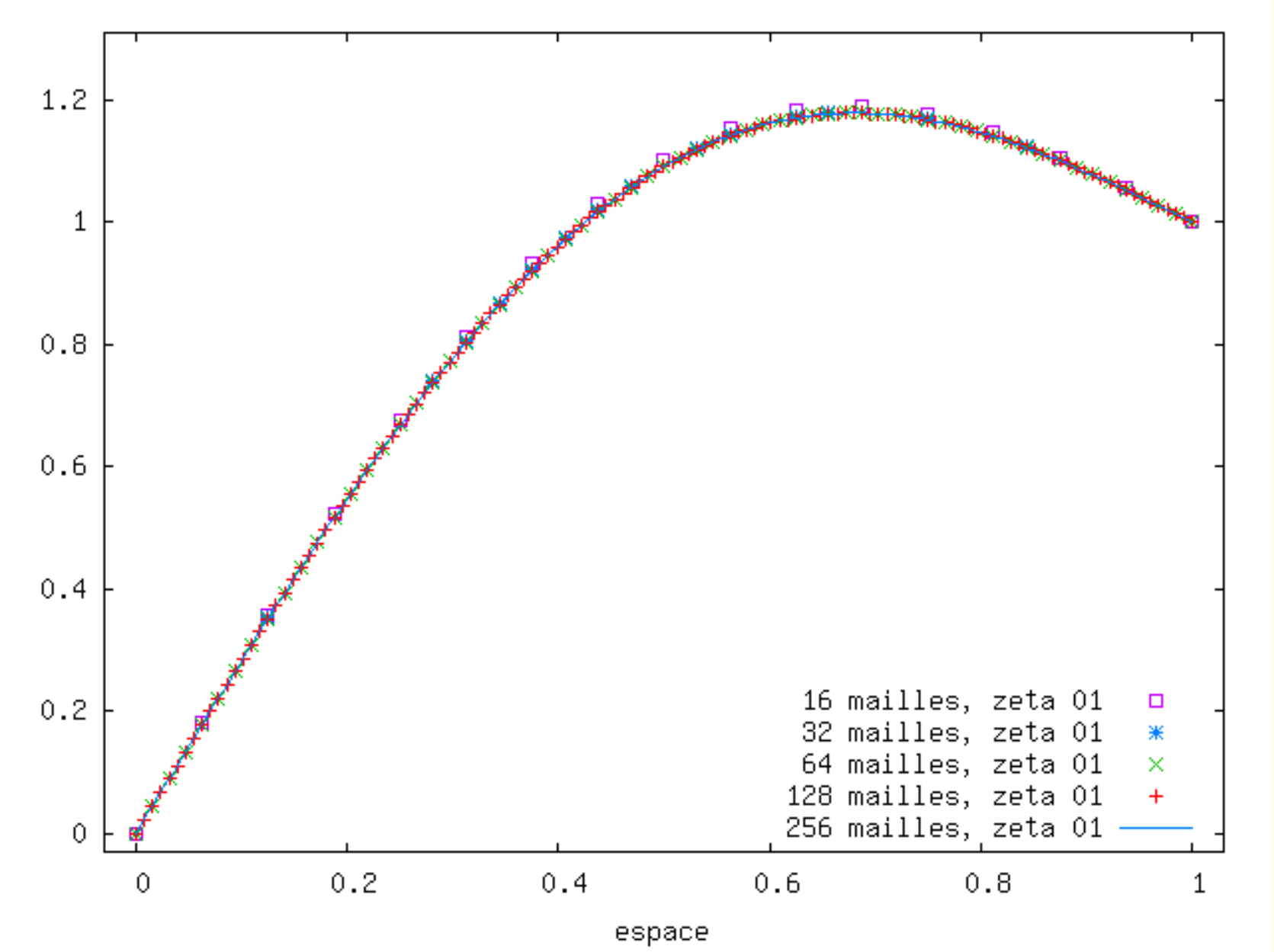
Diffusion, $\zeta = 1$, 64 mailles, iteration 400



ζ variable, N fixé, temps final = 0.09765625



Convergence, $\zeta = 1$, temps final $= 0.09765625$



Convergence, $\zeta = 1$, temps final $= 0.09765625$

Combien de chiffres sont exacts pour $x = 1/2$
après chaque simulation ?

(programmation en Octave [matlab])

16 mailles	25 pas de temps	$u_{16} = 1.10302478761504$
32 mailles	100 pas de temps	$u_{32} = 1.09365268187722$
64 mailles	400 pas de temps	$u_{64} = 1.09126954085441$
128 mailles	1600 pas de temps	$u_{128} = 1.09067122904358$
256 mailles	6400 pas de temps	$u_{256} = 1.09052149287949$

(programmation en Fortran)

512 mailles	25600 pas de temps	$u_{512} = 1.09048404894498$
1024 mailles	102400 pas de temps	$u_{1024} = 1.09047468734076$
2048 mailles	409600 pas de temps	$u_{2048} = 1.09047234689215$

Précision du schéma (profil sinusoïdal)