

1.

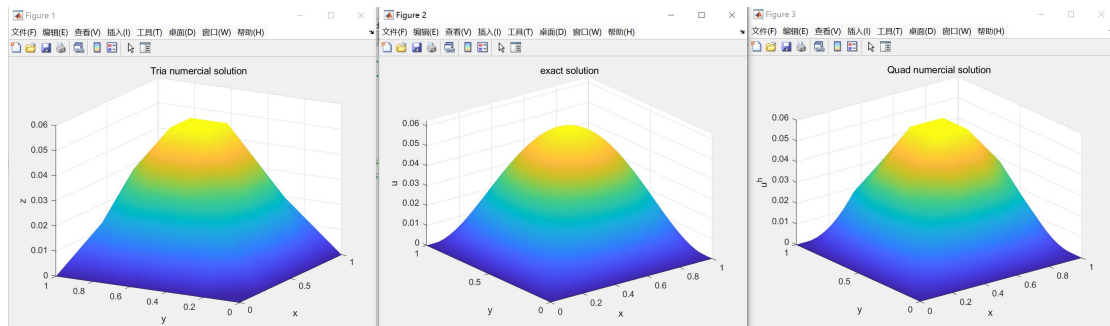
Exercise 3  $m=1, k=2$

$L_2$ error $\ e\ _0 \leq ch^{\frac{1}{2}} \ u\ _3$ $\ e\ _1 \leq ch^{\frac{3}{2}} \ u\ _3$	$\ e\ _0 \leq ch^{\theta} \ u\ _{k+1}$ $\theta = \min(k+1-s, 2(k+1-m))$
$H_1$ error $\ e\ _1 \leq ch^0 \ u\ _1$	$\ e\ _m = ch^{\alpha} \ u\ _r$ $\alpha = \min(k+1-m, r-m)$

Exercise 4

$L_2$ error $\ e\ _0 \leq ch^4 \ u\ _4$ $\ e\ _1 \leq ch^3 \ u\ _4$ $\ e\ _2 \leq ch^2 \ u\ _4$	$H_1$ error $\ e\ _2 \leq ch^{-1} \ u\ _1$ $H_2$ error $\ e\ _2 \leq ch^0 \ u\ _2$
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2.

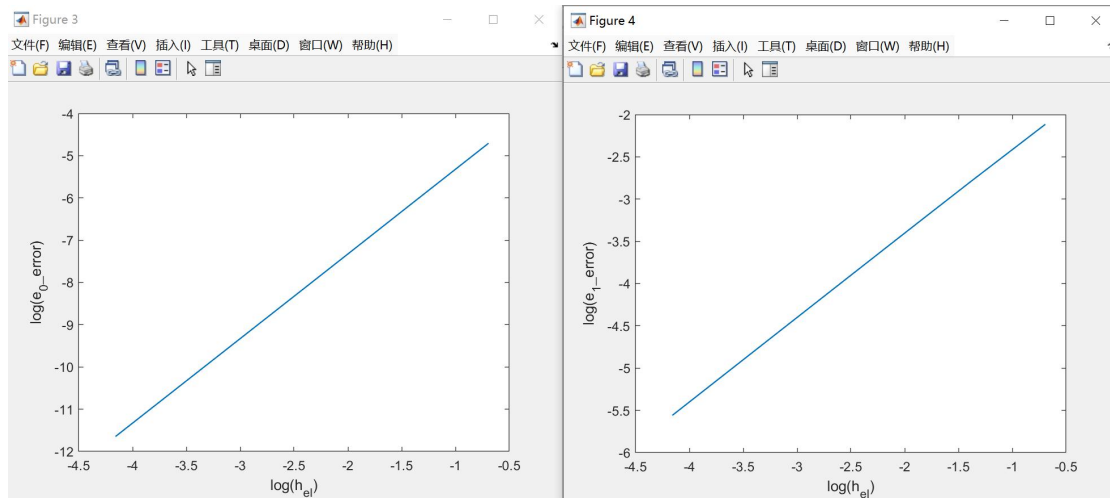


3.

$$\|e\|_0 = ch^2 \|u\|_2$$

$$\|e\|_1 = ch^1 \|u\|_2$$

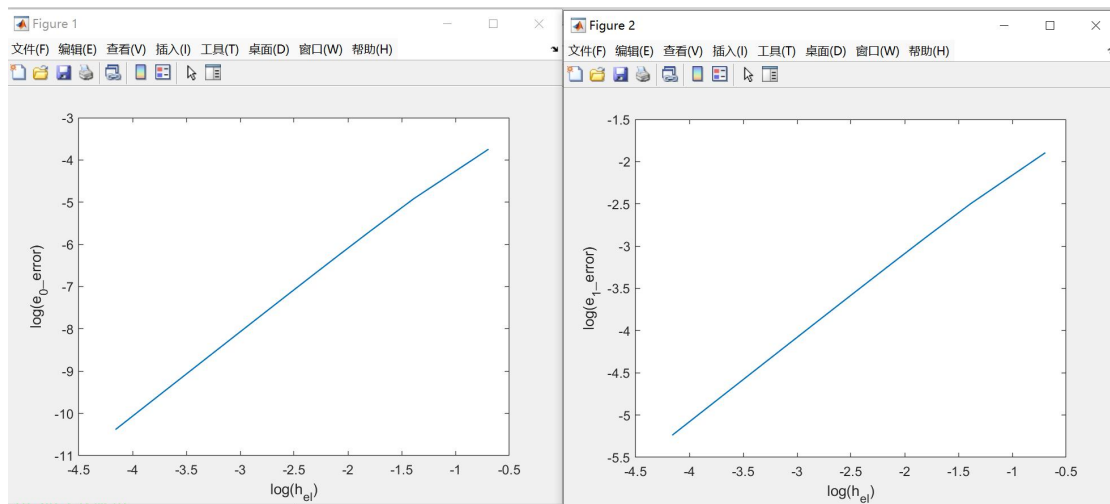
Quadratic element:



$\text{slope\_e\_0} = 2.0022$

$\text{slope\_e\_1} = 0.9970$

Triangle element:



$\text{slope\_e\_0} = 1.9565$

$\text{slope\_e\_1} = 0.9820$