## **Solution 22.2**

The integral can be evaluated analytically as,

$$I = \int_{1}^{2} \left( x + \frac{1}{x} \right)^{2} dx = \int_{1}^{2} x^{2} + 2 + x^{-2} dx$$

$$I = \left[ \frac{x^{3}}{3} + 2x - \frac{1}{x} \right]_{1}^{2} = \frac{2^{3}}{3} + 2(2) - \frac{1}{2} - \frac{1^{3}}{3} - 2(1) + \frac{1}{1} = 4.8333$$

The tableau depicting the implementation of Romberg integration to  $\varepsilon_s = 0.5\%$  is

iteration→	1	2	3
$\varepsilon_t \rightarrow$	6.0345%	0.0958%	0.0028%
$\varepsilon_a \rightarrow$		1.4833%	0.0058%
1	5.12500000	4.83796296	4.83347014
2	4.90972222	4.83375094	
4	4.85274376		

Thus, the result is 4.83347014.

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