

Bradley Quinn Question 1 Residual Correction Method

$$\left[\begin{array}{cc|c} 1 & 0.5 & 1 \\ 0.5 & 0.333333 & 0 \end{array} \right] \xrightarrow{R_2 - \frac{1}{2}R_1} \left[\begin{array}{cc|c} 1 & 0.5 & 1 \\ 0 & 0.08 & -0.5 \end{array} \right]$$

Back Substitution for \hat{x}

$$x_2(0.08) = -0.5, \quad x_2 = -6.25$$

$$x_1 + (0.5)(-6.25) = 1, \quad x_1 - 3.125 = 1, \quad x_1 = 4.13$$

$$\hat{x} = \left\{ \begin{array}{cc} 4.13 & -6.25 \\ x_1 & x_2 \end{array} \right\}$$

$$r = b - A\hat{x}, \quad r = \begin{bmatrix} 1 \\ 0 \end{bmatrix} - \begin{bmatrix} 1 & 0.5 \\ 0.5 & 0.333333 \end{bmatrix} \begin{bmatrix} 4.13 \\ -6.25 \end{bmatrix} =$$

$$r = \begin{bmatrix} 1 \\ 0 \end{bmatrix} - \begin{bmatrix} 1.01 \\ -0.02 \end{bmatrix} = \begin{bmatrix} 1 - 1.01 \\ 0 - (-0.02) \end{bmatrix} = \begin{bmatrix} -0.01 \\ 0.02 \end{bmatrix}$$

From, $Ae = r$, we can find \hat{e} and estimate of our error e

$$\left[\begin{array}{cc|c} 1 & 0.5 & -0.01 \\ 0.5 & 0.3333 & 0.02 \end{array} \right] \xrightarrow{R_2 + \frac{1}{2}R_1} \left[\begin{array}{cc|c} 1 & 0.5 & 0.015 \\ 0 & 0.08 & 0.02 \end{array} \right]$$

Back substitute for \hat{e}

$$\hat{e}_2 \frac{(0.08)}{(0.08)} = \frac{(0.02)}{(0.08)}, \quad \hat{e}_2 = 0.25$$

$$\hat{e}_1 + 0.5(0.25) = 0.015, \quad \hat{e}_1 + \frac{0.125}{-0.125} = \frac{0.015}{-0.125}, \quad \hat{e}_1 = -0.11$$

$$\hat{e} = \{ \hat{e}_1, \hat{e}_2 \} = \{ -0.11, 0.25 \}$$

$$\text{Solve linear System: } x \approx \hat{x} + \hat{e} = [4.02, 6.00]$$