

How Much Time Does Back Substitution Take

Major: All Engineering Majors

Author(s): Autar Kaw

<http://numericalmethods.eng.usf.edu>

Transforming Numerical Methods Education for STEM Undergraduates

Back Substitution

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} & \cdots & a_{1n} \\ 0 & a'_{22} & a'_{23} & \cdots & a'_{2n} \\ 0 & 0 & a''_{33} & \cdots & a''_{3n} \\ \vdots & \vdots & \vdots & \cdots & \vdots \\ 0 & 0 & 0 & 0 & a^{(n-1)}_{nn} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ \vdots \\ x_n \end{bmatrix} = \begin{bmatrix} b_1 \\ b'_2 \\ b''_3 \\ \vdots \\ b^{(n-1)}_n \end{bmatrix}$$

$$x_n = \frac{b_n^{(n-1)}}{a_{nn}^{(n-1)}}$$

$$x_i = \frac{b_i^{(i-1)} - \sum_{j=i+1}^n a_{ij}^{(i-1)} x_j}{a_{ii}^{(i-1)}} \text{ for } i = n-1, \dots, 1$$

```
n = length(B);
X(n)=B(n)/A(n,n)
```

```
for i=n-1:-1:1
    X(i) = B(i);
    for j=(i+1):1:n
        X(i) = X(i) - A(i, j)*X(j);
    end
    X(i) = X(i)/A(i, i);
end
```

Back Substitution

$$CT|_{BS} = T(4n^2 + 12n)$$

<http://numericalmethods.eng.usf.edu>

THE END

<http://numericalmethods.eng.usf.edu>