Midterm #1

1. For upper triangular and back substitution:

```
function [x] = BackSubTridiag(n,v,w,b)
    x(n) = b(n)/v(n);
    for i = n-1:-1:1
        x(i) = (b(i)-w(i)*x(i+1))/v(i);
    end
end
```

   For lower triangular and forward substitution:

```
function [x] = ForwardSubTridiag(n,v,w,b)
    x(1) = b(1)/v(1);
    for i = 2:n
        x(i) = (b(i)-w(i-1)*x(i-1))/v(i);
    end
end
```

2. Let the matrix be $n \times n$. Let $\hat{\imath}$ be the row such that $a_{\hat{\imath},j}$, for $j = \hat{\imath}, \dots, n$, is nonzero. Similarly, let $\hat{\jmath}$ be the column such that $a_{i,\hat{\jmath}}$, for $i = 1, \dots, \hat{\jmath}$, is nonzero.

   The number of flops is $3n + 2\hat{\jmath} - 2\hat{\imath} - 4$.

3. Let $\hat{\imath}, \hat{\jmath}$ be the indices of interest: we want to find $a_{\hat{\imath},\hat{\jmath}}$.

   - Yellow: $a_{\hat{\imath}-1,\hat{\imath}-1} = 4, a_{\hat{\imath}-1,\hat{\imath}} = -2, a_{\hat{\imath}-1,\hat{\jmath}} = 1$ and $a_{\hat{\imath},\hat{\imath}} = 3, a_{\hat{\imath},\hat{\jmath}} = 4/3$.
   - Pink: $a_{\hat{\imath}-1,\hat{\imath}-1} = 5, a_{\hat{\imath}-1,\hat{\imath}} = 1, a_{\hat{\imath}-1,\hat{\jmath}} = 3$ and $a_{\hat{\imath},\hat{\imath}} = 4, a_{\hat{\imath},\hat{\jmath}} = -5/4$.
   - Green: $a_{\hat{\imath}-1,\hat{\imath}-1} = 4, a_{\hat{\imath}-1,\hat{\imath}} = 1, a_{\hat{\imath}-1,\hat{\jmath}} = -2$ and $a_{\hat{\imath},\hat{\imath}} = 3, a_{\hat{\imath},\hat{\jmath}} = -2/3$.
   - Blue: $a_{\hat{\imath}-1,\hat{\imath}-1} = 5, a_{\hat{\imath}-1,\hat{\imath}} = -2, a_{\hat{\imath}-1,\hat{\jmath}} = -1$ and $a_{\hat{\imath},\hat{\imath}} = 4, a_{\hat{\imath},\hat{\jmath}} = 3/4$.

4. See HW solutions.