1. Problem 10.1
Householder reflector $F = I - 2 \frac{vv^*}{v^*v}$, where $v \in \mathbb{C}^m$. Now, $Fv = -v$. Also, $Fu = u, \forall u$ orthogonal to $v$. Let $U$ be an orthonormal basis of the $m-1$ dimensional subspace orthogonal to $v$. Thus, eigenvalue decomposition of $F$ is given by $F = [v \ U] \Lambda [v \ U]^*$, where $\Lambda$ is a diagonal matrix with $\Lambda_{11} = -1$ and $\Lambda_{ii} = 1, \forall i > 1$. Now, $\det(F) = \prod_{i=1}^{m} \Lambda_{ii} = -1$. All the singular values are equal to 1.

2. Problem 10.4
(a) Consider a two-dimensional vector $v = \begin{bmatrix} r \cos \phi \\ r \sin \phi \end{bmatrix}$. Now $Fv = \begin{bmatrix} -r \cos(\phi + \theta) \\ r \sin(\phi + \theta) \end{bmatrix}$. Similarly, $Jv = \begin{bmatrix} r \cos(\phi - \theta) \\ r \sin(\phi - \theta) \end{bmatrix}$. Thus, $F$ rotates $v$ anticlockwise by the angle $\theta$ and then reflects it along the $y$-axis. Similarly, $J$ rotates every vector $v$ clockwise by the angle $\theta$.
(b) for $j=1$ to $n$
   for $i=m$ to $j+1$
     $r = \sqrt{A(i-1,j)^2 + A(i,j)^2}$
     $c = A(i-1,j)/r, \ s = A(i,j)/r$
     Form $J = \begin{bmatrix} c & s \\ -s & c \end{bmatrix}$
     $A(i-1 : i, j : n) = JA(i-1 : i, j : n)$
   end for
end for
(c) Number of floating point operations (flops) to form $J$: 4 multiplication, 1 addition, 1 square root. Each $J$ makes one of the entries of $A$ zero. Hence, the number of flops required per entry is 6.