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Math 371
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Homework #9

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Q1
Count the total number of multiplications and divisions in the following code in terms of n. Assume that the values of all variables are given.

Answer: From the notation below, we have $(n-1)(n)/2 + (n-1)(n)/2 = n^2 - n \in O(n^2)$ multiplications and $1 + (n-1) = n \in O(n)$ divisions.

```
for k=1:n-1
 for i=K+1:n
 B(i)=B(i) - A(i,k) * B(k); %  1
      sum_{k=1}^{n-1} sum_{i=k+1}^{n} (1) = (1) . (n-1+n-2+...+1) = sum_{m=1}^{n-1} m = (n-1)(n)/2
 end
end

X(n)=B(n) / A(n,n); % 1

for i=n-1:-1:1
 s=B(i);
 for j=i+1:n
  s=s-A(i,j) * X(j); % sum_{i=1}^{n-1} sum_{j=i+1}^{n} (1) = (1) . (n-1+n-2+...+1) = sum_{m=1}^{n-1} m = (n-1)(n)/2
 end
X(i)=s / A(i,i); % sum_{i=1}^{n-1} = (1) . (n-1) = n-1

end
```