Algorithm for Gaussian Elimination with Partial Pivoting  
Math 121, Spring 2011  
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GAUSSIAN ELIMINATION WITH PARTIAL PIVOTING

input $n, (a_{ij})$

for $k = 1$ to $n$ do
  $p_k = k$
end do

for $k = 1$ to $n - 1$ do
  Choose $j \geq k$ as the smallest integer so that $|a_{pj,k}| = \max_{k \leq i \leq n} |a_{pi,k}|$
  $p_k \leftrightarrow p_j$
  for $i = k + 1$ to $n$ do
    $a_{pi,k} = a_{pj,k}$
    for $j = k + 1$ to $n$ do
      $a_{pi,j} = a_{pi,j} - a_{pi,k}a_{pj,j}$
    end do
  end do
end do

SOLVING

Forward Substitution

for $k = 1$ to $n - 1$ do
  for $i = k + 1$ to $n$ do
    $b_{pi} = b_{pi} - a_{pi,k}b_{pk}$
  end do
end do

Backward Substitution

for $i = n - 1$ to $1$ do
  $x_i = \left( b_{pi} - \sum_{j=i+1}^{n} a_{pi,j}x_j \right) a_{pi,i}^{-1}$
end do

output $(x_i)$