function [U,R] = householder(A) % Produce R from Householder reflectors saved in U

[m, n] = size(A); U = zeros(m, n);

for k = 1:n

% start with column k of current A, from diagonal down

w = A(k:m,k);

% subtract (w,0,...,0) from a = w. New w = a-r

w(1) = w(1)-norm(w);

% normalize to unit vector u in the kth reflector H\_k

u = w/norm(w);

% save u in U to know the H's that produce Q

U(k:m,k) = u;

% multiply current A by H\_k

A(k:m,k:n) = A(k:m,k:n)-2\*u\*(u'\*A(k:m,k:n));

end

% square R from nonzeros on and above diagonal of final A

R = triu(A(:,1:n));

