

Bi7740: Scientific computing

Eigenvalues and eigenvectors - Exercises

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Power method

```
function [v, lambda] = eig_power(A, x0, max_iter,  $\Delta$ )
...
x0 = x0(:); % make it a column vector
lambda = 0;
for k = 1:max_iter
    lambda1 = lambda;
    x1 = A*x0/norm(x0,inf);
    [xm,m] = max(abs(x1));
    lambda = x1(m); % new eigenvalue: the ...
                    largest in new x
    if (norm(x1-x0) <  $\Delta$ ) && (abs(lambda1-lambda) <  $\Delta$ )
        break
    end
    x0 = x1; % new approximation is x0
end
...
v = x0/norm(x0); % ensure unit norm
```

Try it:

```
>> A = [2 0 1;0 -2 0;1 0 2];  
>> [v,l] = eig_power(A)
```

```
v =  
  
3
```

```
l =  
  
0.7071  
-0.0000  
0.7071
```

```
>> [v,l] = eig(A)
```

```
v =  
  
0 0.7071 0.7071  
-1.000 0 0  
0 -0.7071 0.7071
```

```
l =  
  
-2 0 0  
0 1 0  
0 0 3
```