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# Oplossingen oefenzitting 7

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## Inhoudsopgave

### 1 Opgave 4

```
function [A, b, x, kapA, kapbx, eta, costheta] = opgave4(sigma, c, U, V)

m = size(U,1);
n = size(V,1);
S = [diag(sigma); zeros(m-n,n)];
A = U * S * V';
b = U * c;
z = c(1:n) ./ sigma;
x = V * z;

kapA = cond(A);
eta = norm(A) * norm(x) / norm(A*x);
costheta = norm(A*x) / norm(b);
kapbx = kapA / (eta*costheta);
```

### 2 Opgave 5

```
function opgave5(sigma, U, V, type)

% veronderstel dat de sigma geordend zijn van groot naar klein
I = eye(10);
e1 = I(:,1);
e7 = I(:,7);
if type == 1
    c = rand(10,1);
```

```

    dc = rand(10,1);
elseif type == 2
    c = rand * e1;
    dc = rand * e7;
elseif type == 3
    c = rand * e7;
    dc = rand * e1;
elseif type == 4
    c = rand(10,1);
    dc = [zeros(7,1); rand(3,1)];
elseif type == 5
    c = rand(10,1);
    dc = [rand(7,1); zeros(3,1)];
end

% oorspronkelijk stelsel
tol = 1e-8;
[A, b1, x1, kapA, kapbx, eta] = opgave4(sigma, c, U, V);

% geperturbeerd stelsel via opgave4
[A, b2, x2] = opgave4(sigma, c + tol * dc, U, V);

% geperturbeerd stelsel via \ operator
% b2 = b1 + tol * U * dc;
% x2 = A \ b2;

rx = norm(x2-x1) / norm(x1);
rb = norm(b2-b1) / norm(b1);
kexp = rx / rb;

fprintf(1, '%.1e %3d %.1e %.1e %.1e %.1e %.1e \n', ...
        kapA, type, eta, kapbx, rx, rb, kexp);

```

```

U = orth(rand(10));
V = orth(rand(7));

fprintf(1, '%7s %4s %7s %7s %7s %7s %7s \n', ...
        'kap_A', 'type', 'eta', 'kap_bx', 'rx', 'rb', 'k_exp');
for kappa = [1 1e3 1e6]
    sigma = linspace(kappa, 1, 7)';
    for type = [1 2 3]
        opgave5(sigma, U, V, type);
    end
    fprintf('\n')
end

```

```
end
```

kap_A	type	eta	kap_bx	rx	rb	k_exp
1.0e+00	1	1.0e+00	1.5e+00	1.6e-08	1.3e-08	1.3e+00
1.0e+00	2	1.0e+00	1.0e+00	1.6e-08	1.6e-08	1.0e+00
1.0e+00	3	1.0e+00	1.0e+00	2.3e-08	2.3e-08	1.0e+00
1.0e+03	1	4.3e+02	2.7e+00	7.5e-09	1.0e-08	7.2e-01
1.0e+03	2	1.0e+00	1.0e+03	1.4e-04	1.4e-07	1.0e+03
1.0e+03	3	1.0e+03	1.0e+00	1.6e-11	1.6e-08	1.0e-03
1.0e+06	1	3.6e+05	3.2e+00	1.3e-08	7.8e-09	1.7e+00
1.0e+06	2	1.0e+00	1.0e+06	2.1e-02	2.1e-08	1.0e+06
1.0e+06	3	1.0e+06	1.0e+00	5.5e-14	5.5e-08	1.0e-06

### 3 Opgave 6

```
U = orth(rand(10));
V = orth(rand(7));

fprintf(1, '%7s %4s %7s %7s %7s %7s %7s \n', ...
        'kap_A', 'type', 'eta', 'kap_bx', 'rx', 'rb', 'k_exp');
for kappa = [1 1e3 1e6]
    sigma = linspace(kappa, 1, 7)';
    for type = [4 5]
        opgave5(sigma, U, V, type);
    end
    fprintf('\n')
end
```

kap_A	type	eta	kap_bx	rx	rb	k_exp
1.0e+00	4	1.0e+00	1.0e+00	0.0e+00	7.8e-09	0.0e+00
1.0e+00	5	1.0e+00	1.2e+00	1.5e-08	1.3e-08	1.2e+00
1.0e+03	4	4.9e+02	2.5e+00	0.0e+00	5.3e-09	0.0e+00
1.0e+03	5	9.9e+01	1.4e+01	7.4e-08	9.5e-09	7.7e+00
1.0e+06	4	2.6e+05	5.2e+00	0.0e+00	6.3e-09	0.0e+00
1.0e+06	5	3.6e+05	3.2e+00	1.1e-08	6.6e-09	1.6e+00

### 4 Opgave 7

```
t = [1.01; 1.02; 1.03; 1.04; 1.05; 1.06; 1.07];
```

```
A1 = [ones(7,1) t]
```

```
A2 = [ones(7,1) 30*(t-1.04)]
```

```
cond1 = cond(A1)
```

```
cond2 = cond(A2)
```

```
A1 =
```

1.0000e+00	1.0100e+00
1.0000e+00	1.0200e+00
1.0000e+00	1.0300e+00
1.0000e+00	1.0400e+00
1.0000e+00	1.0500e+00
1.0000e+00	1.0600e+00
1.0000e+00	1.0700e+00

```
A2 =
```

1.0000e+00	-9.0000e-01
1.0000e+00	-6.0000e-01
1.0000e+00	-3.0000e-01
1.0000e+00	0
1.0000e+00	3.0000e-01
1.0000e+00	6.0000e-01
1.0000e+00	9.0000e-01

```
cond1 =
```

1.0409e+02
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```
cond2 =
```

1.6667e+00
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