Untitled

March 10, 2021

[1]:
```
using LinearAlgebra
```

[7]:
```
# Conjugate gradient solver

function CG(A,b,x0,tol=1e-5,maxit=1000)
    r = b - A * x0;
    x = x0
    p = r;
    rsold = transpose(r) * r;
    if norm(rsold) < tol
        return x
    end
    for i in collect(1:length(b))
        Ap = A * p;
        alpha = rsold / (transpose(p) * Ap);
        x = x + alpha * p;
        r = r - alpha * Ap;
        rsnew = transpose(r) * r;
        if sqrt(rsnew) < tol
              break;
        end
        p = r + (rsnew / rsold) * p;
        rsold = rsnew;
    end
    return x
end
```

[7]:
```
CG (generic function with 3 methods)
```

[18]:
```
A = [4 1; 1 3];
b = [1,2];
x_exact = A\b
```

[18]:
```
2-element Array{Float64,1}:
 0.09090909090909091
 0.6363636363636364
```

[22]:
```
x0 = [2,1];
CG(A, b, x0)
```

```
[22]: 2-element Array{Float64,1}:
       0.09090909090909094
       0.6363636363636365
```