

The goals of this discussion section are:

1. Work on your homework 7 group problem (early start compared to other times)
2. Get familiar with linear solvers

Participation in discussion section counts as 5% of the grade. Completion of the worksheets counts as 20% of the grade. **Submit your worksheet work by April 7th at 2:59pm.**

1. Work on your Homework 7 as a group. Take advantage of this common time to make the most of it (recall it is due by April 14th at 11:59pm). Take this time to get familiar with the problem and assign roles.
2. Solve a 5×5 linear system of the form $Ax = b$, with A, b of your choice (A can't be the identity matrix, and should have most of its entry non zero). Compare with the solution obtained while computing directly $x = A^{-1}b$ with the one obtained with the `conjugate_gradient` function

```
def conjugate_gradient(A, b, x0, eta, Imax):
    x = x0
    r = b - A@x
    d = r
    n0 = np.dot(r,r)
    n1 = n0
    res = []
    i = 0
    while n0 > eta, and i < Imax:
        z = A@d
        alpha = n0 / (np.dot(z,d))
        x = x + alpha * d
        r = r - alpha * z
        n1 = np.dot(r,r)
        beta = n1 / n0
        d = r + beta * d
        n0 = n1
        i = i+1
        res = [res, np.sqrt(n1)]
        if np.sqrt(n1) > 1e10:
            break
    return x, i, res
```

Provide comments on your choices of parameters, what you observe overall (computational time, error, etc.).

3. Submit your work (**only item 2.**) on Catcourses under the assignment **Worksheet 10 as a .pdf**. You will submit your work for item 1. within the assignment **Homework 7 (group)** in two weeks.