solutions from last lecture’s problems

problem time

how would you do the following? you have two 1x99 arrays, **growth** and **age**.

- find how many cells had growth above .4 and an age below 15 days
- make a new array which holds only the ages of the cells which had growth which was larger than the mean growth
- remove all the data from growth which is smaller than the mean
- add a new cell to the arrays with .45 growth measurement and 7 days old
- create a new array which stores the value of growth times age for each cell
- challenge: choose a **random** element of the age vector, and then return the value of this index of the growth vector (must use a rand function!)

problem time

how would you do the following? you have two 1x99 arrays, **growth** and **age**.

- find how many cells had growth above .4 and an age below 15 days

```
sum(growth>.4 & age<15)
```

problem time

how would you do the following? you have two 1x99 arrays, **growth** and **age**.

- make a new array which holds only the ages of the cells which had growth which was larger than the mean growth

```
old_cells = age(growth>mean(growth))
```

problem time

how would you do the following? you have two 1x99 arrays, **growth** and **age**.

- remove all the data from growth which is smaller than the mean

```
growth = growth(growth<mean(growth)
```

problem time

how would you do the following? you have two 1x99 arrays, **growth** and **age**.

- add a new cell to the arrays with .45 growth measurement and 7 days old

```
growth(end+1) = .45; age(end+1) = 7;
```

problem time

how would you do the following? you have two 1x99 arrays, **growth** and **age**.

- create a new array which stores the value of growth times age for each cell

```
newarray = growth .* age;
```

problem time

how would you do the following? you have two 1x99 arrays, **growth** and **age**.

- challenge: choose a **random** element of the age vector, and then return the value of this index of the growth vector (must use a rand function!)

```
growth(age(randi(length(age))))
```

to break this down (doesn't need to be one line)

```
max_rand_index = length(age);
rand_cell_chosen = randi(max_rand_index);
rand_age = age(rand_cell_chosen); % a number 1-30, all within the length of growth!
growth(rand_age)
```

welcome back wednesday

strong suggestion!

read the matlab docs for plotting early and often!

https://www.mathworks.com/help/matlab/ref/plot.html

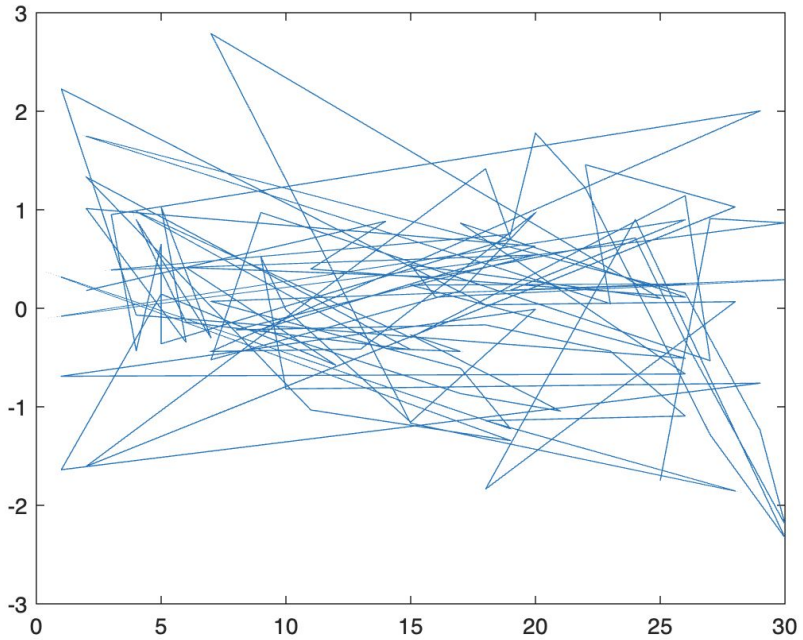
I will open this (or other pages, like for histograms etc) many times while I am coding plots. do not feel like you need to memorize everything, but as you write more and more some of it will come easier (like how to change colors). don't just rely on the problems we do in class and on canvas – there will be things you want to do but we don't show (like how to plot in purple)

plotting basics

I want to know if there is a correlation between growth and the age of cells. how might I visualize this in matlab? (assume original 1x100 vectors growth and age)

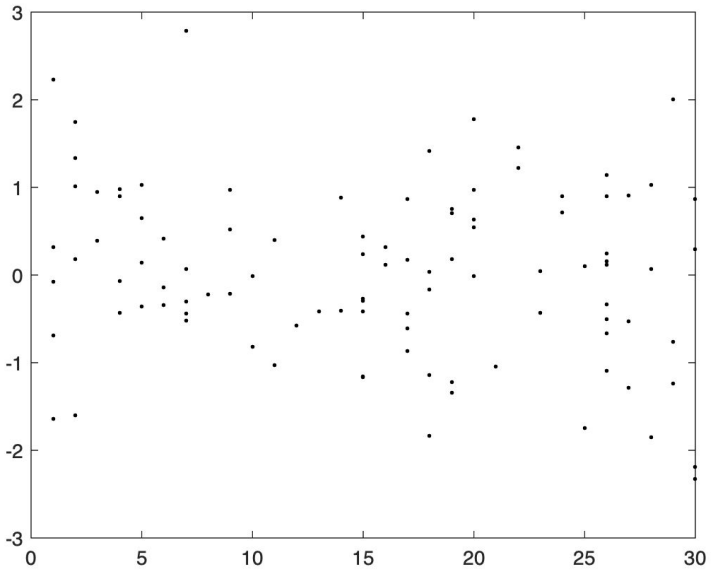
```
growth = randn(1,100);
age = randi(30,1,100);

figure
plot(age,growth)
```

will this work?

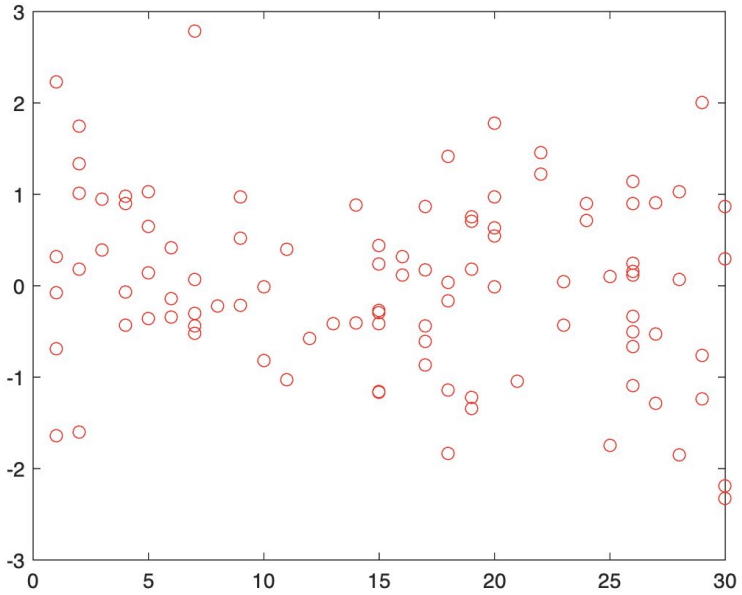


not quite! we need to use **options** to be more specific about the plot we want.

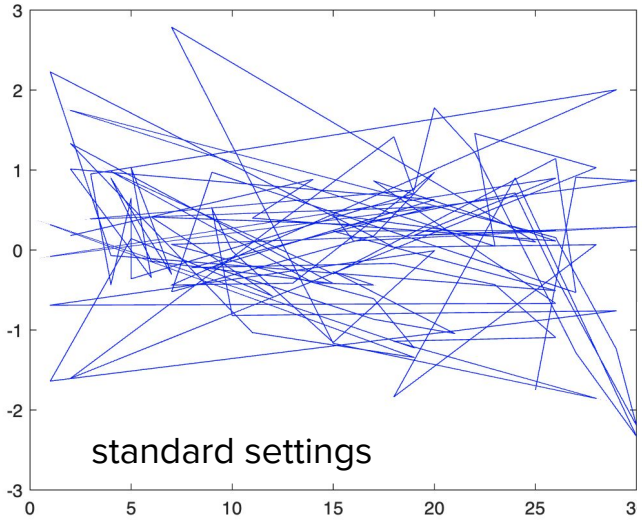
plot(age,growth, ‘k.’)



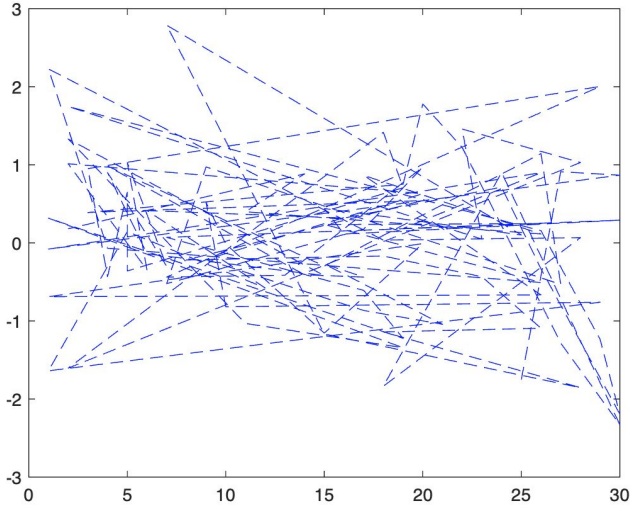
plot(age,growth, ‘ro’)



plot(age,growth, ‘b-’)

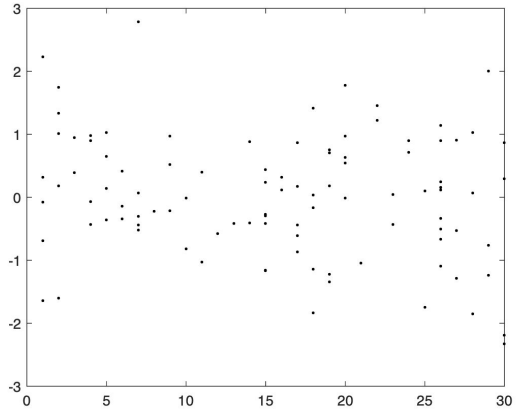


plot(age,growth, ‘b--’)



plot(age,growth, ‘r-’)

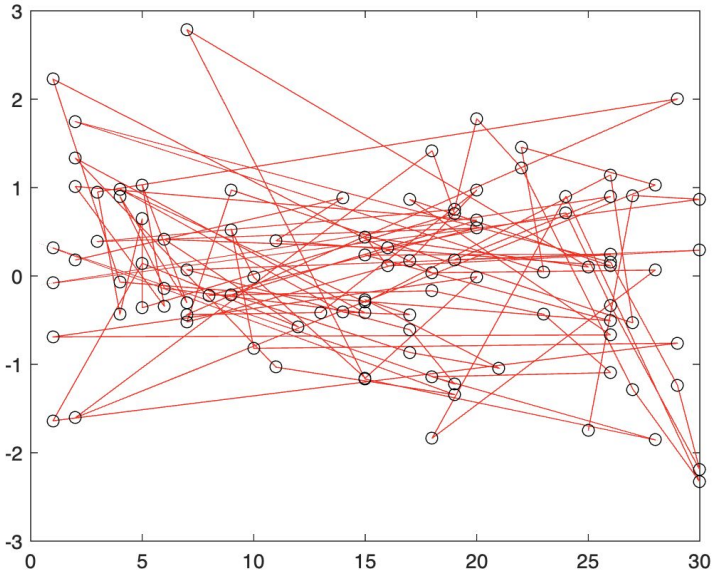
plot(age,growth,’k.’)



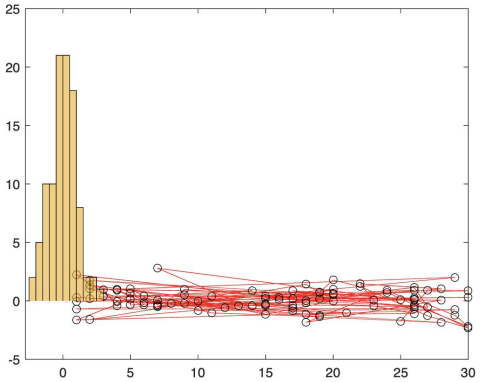
why can’t it plot both?

matlab command: **hold on**
if you want to wait and
keep plotting on top

```
plot(age,growth,'r-')
hold on
plot(age,growth,'ko')
```



make sure to hold off! otherwise you'll keep plotting on the same one if it's still open...

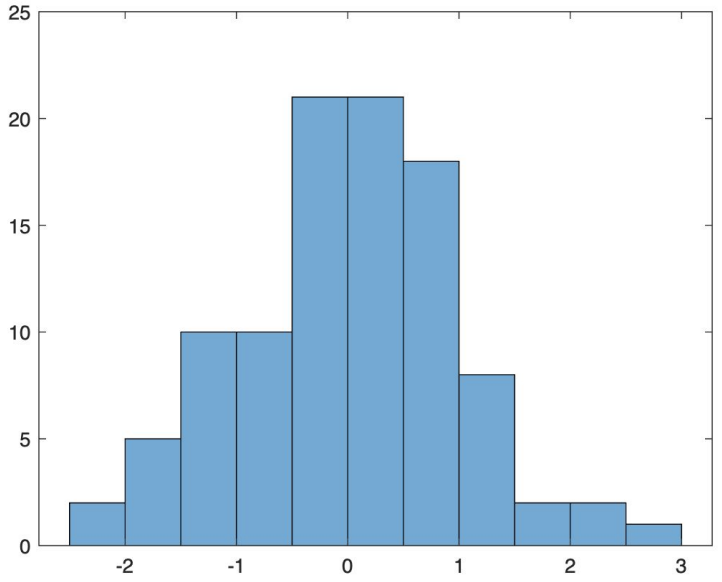


other plots

these line graphs don't tell us much (except that it seems age and growth aren't related – why is that?)

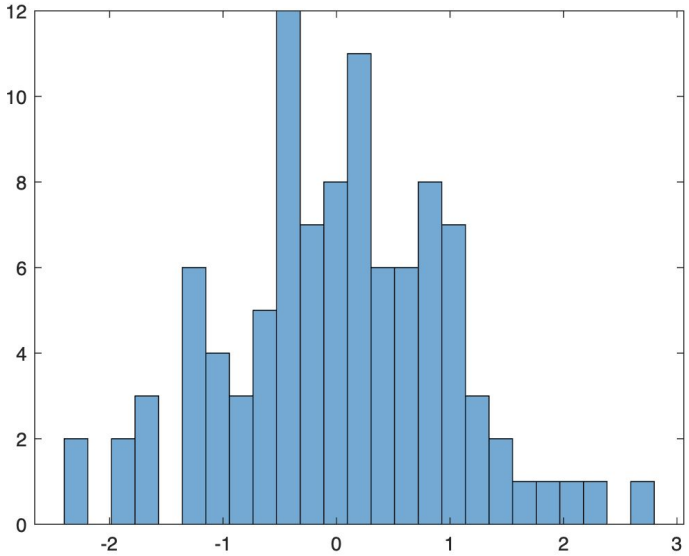
let's look just at the growth variable - maybe we want to see its whole distribution in a histogram

histogram(growth)

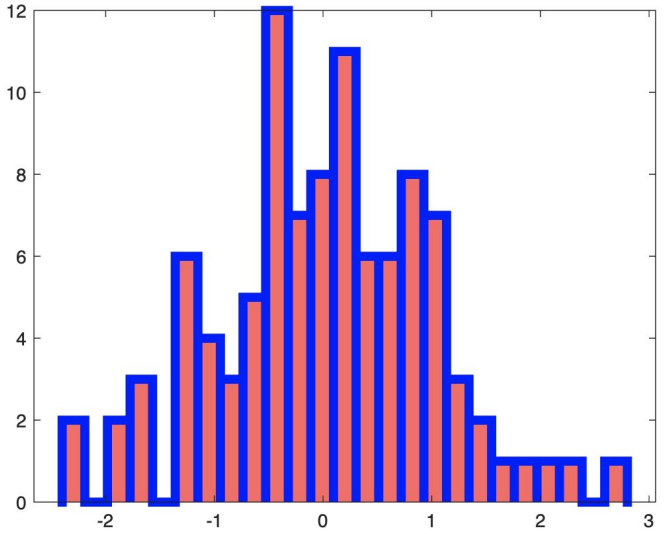


we have other options for histograms too! but for more complex plots we need to pass specific variable names to plotting functions to make changes. you can learn what these are by reading the docs! these exist for plot too

histogram(growth,25)



histogram(growth,25,'FaceColor','red', 'EdgeColor','blue','LineWidth',5)



subplots, figures, labeling, and legend

live demo

now you!

try to make a scatter plot using the commands we've worked on today where the markers for **positive growth** are **magenta stars** and the markers for **negative growth** are **green diamonds.** all markers should be filled. look at documentation!

reminder:

age = randi(30,1,100);

growth = randn(1,100);