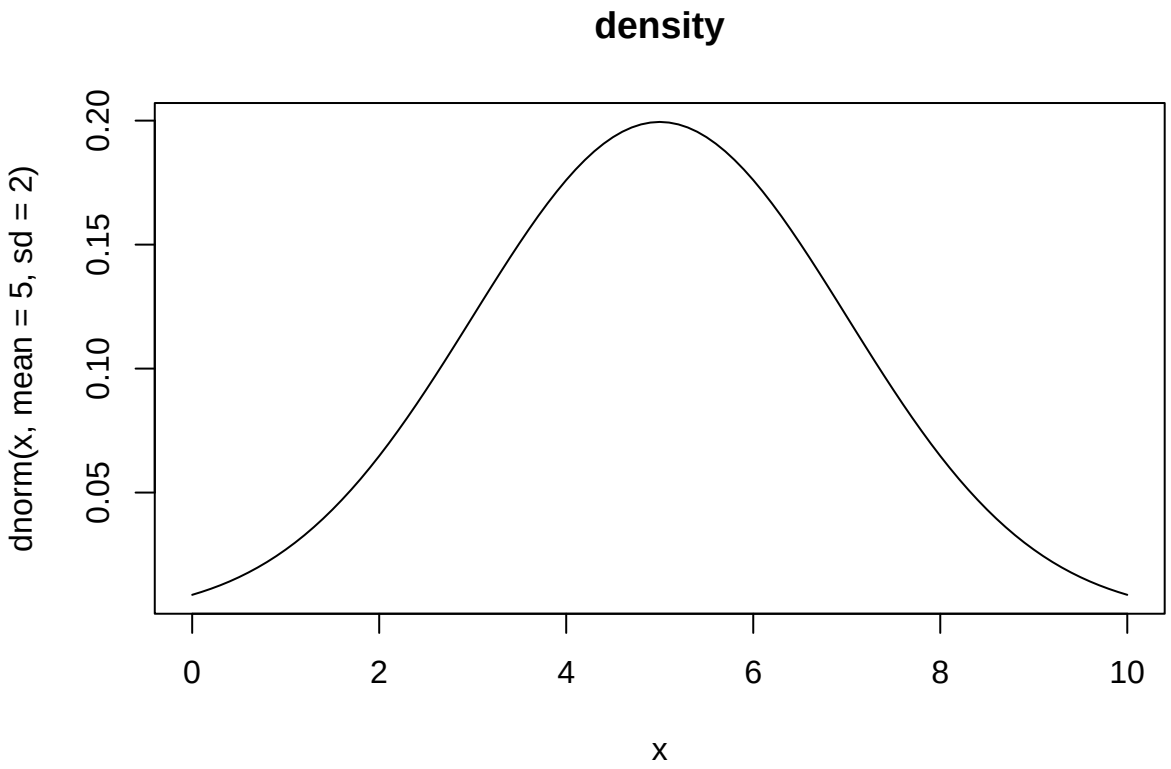
Problem_5

2022-04-06

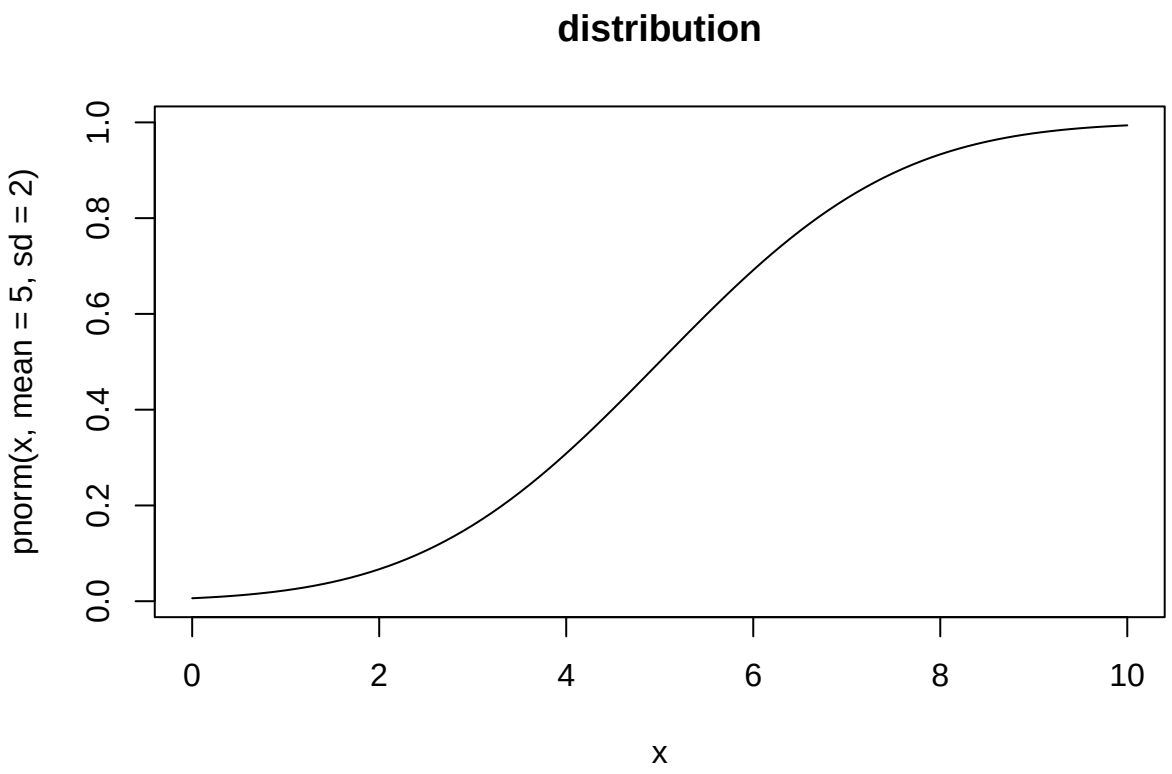
Sum and average

plots of a normal distribution

```
curve(dnorm(x, mean = 5, sd = 2), from = 0, to = 10, main = "density")
```




```
curve(pnorm(x, mean = 5, sd = 2), from = 0, to = 10, main = "distribution")
```



expectation and standard deviation

As $X_1, \ldots, X_{50}$ are idependent we have

$$\mathbb{E}(S) = \mathbb{E}(X_1 + ... + X_{50}) = \mathbb{E}(X_1) + ... + \mathbb{E}(X_{50}) = 50 \cdot 5 = 250$$

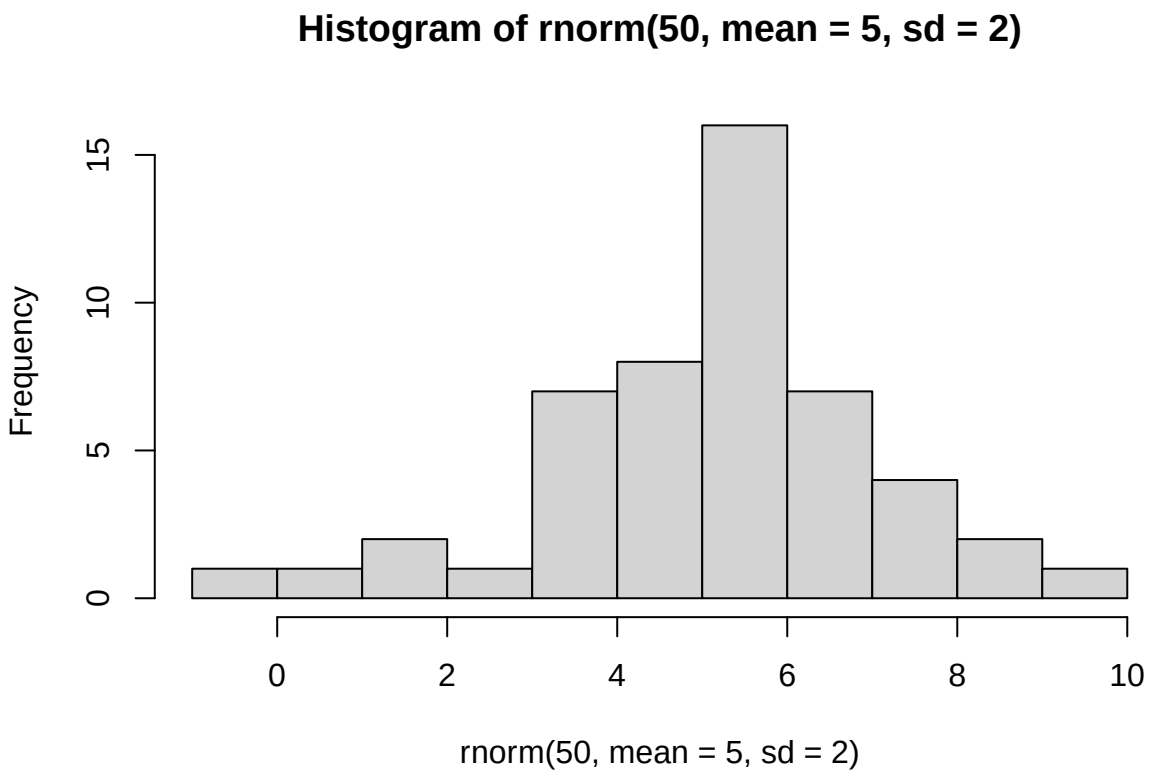
$$\mathbb{V}(S) = \mathbb{V}(X_1 + ... + X_{50}) = \mathbb{V}(X_1) + ... + \mathbb{V}(X_{50}) = 50 \cdot 2 = 100$$

$$\mathbb{E}(\bar{X}) = \mathbb{E}(\frac{1}{50}S) = \frac{1}{50}\mathbb{E}(S) = 5$$

$$\mathbb{V}(\bar{X}) = \mathbb{V}(\frac{1}{50}S) = \frac{1}{50^2}\mathbb{V}(S) = \frac{100}{2500} = \frac{1}{25}$$

histogram

```
hist(rnorm(50, mean = 5, sd = 2))
```




```
hist(rnorm(500, mean = 5, sd = 2))
```