

HARJOITUS 7 -- Ratkaisut

Teht 1.

Luetaan datapisteet tiedostosta taulukkoon.

```
Directory[] (*tarkastetaan työhakemisto*)  
/Users/kailoo
```

Asetetaan tarvittaessa SetDirectory-komennolla

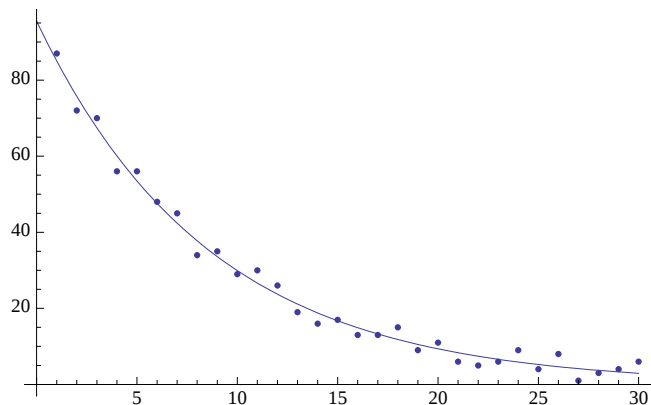
```
data = Import["data_h07.txt", "Table"];
```

Sovitetaan hajoamislakia noudatteleva funktio

```
fit = FindFit[data, a*Exp[-b*x], {a, b}, x]  
{a → 95.5119, b → 0.116099}  
sovitus[x_] = a*Exp[-b*x] /. %  
95.5119 e-0.116099 x
```

Piirretään samaan kuvaajaan

```
Show[ListPlot[data], Plot[sovitus[x], {x, 0, 30}]]
```



```
lambda = b /. fit
```

```
0.116099
```

```
Solve[lambda ==  $\frac{\text{Log}[2]}{\text{tpuoli}}$ , tpuoli]
```

```
{{tpuoli → 5.97032}}
```

Näytteen puoliintumisajaksi saadaan 5.97 minuuttia.

Teht 2

```
Clear[data, t, a, b, fit, sovitus, x]
```

```
data2 = Import["data2_h07.txt", "Table"];
```

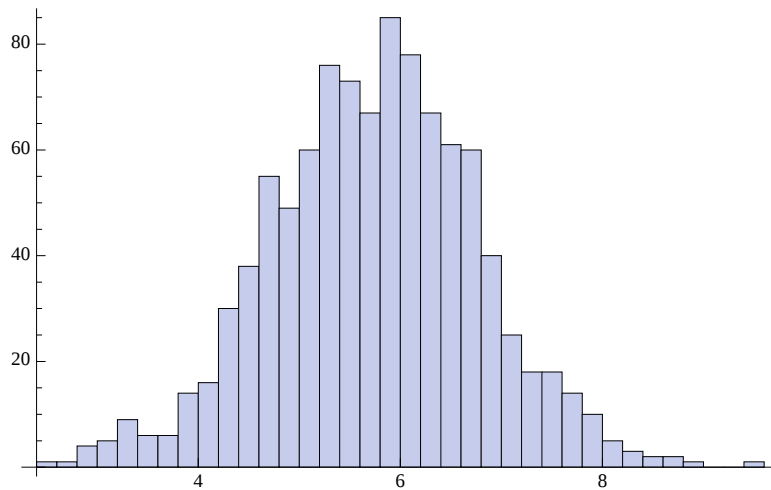
poimitaan ensimmäinen sarake (poistaa {} kaikkien mittausten ympäriltä)

```
data2 = data2[[All, 1]];
```

Mikäli Mathematican versio < 7, tarvitaan histogrammia varten seuraava paketti :

```
Needs["Histograms`"]
```

```
Histogram[data2]
```



```
M = Mean[data2]
```

```
S = Variance[data2]
```

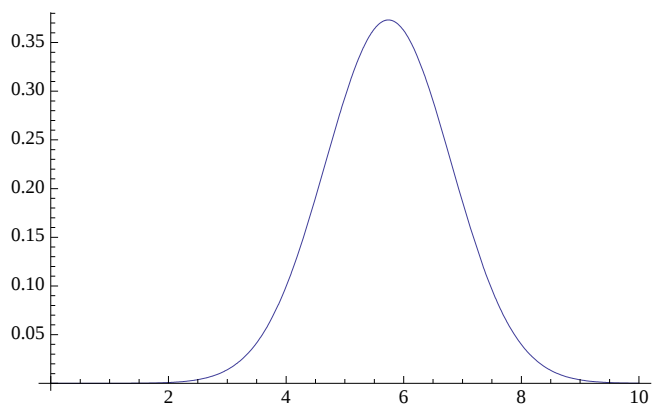
```
5.73973
```

```
1.06904
```

```
P[x_] = PDF[NormalDistribution[M, S], x]
```

```
0.373177 e-0.437501 (-5.73973+x)2
```

```
Plot[P[x], {x, 0, 10}]
```



```
Integrate[P[x], {x, 4, 6}]
```

```
0.544346
```

Teht 3

a)

```
Limit[(Sqrt[4 - x] - 2) / x, x → 0]
```

```

$$-\frac{1}{4}$$

```

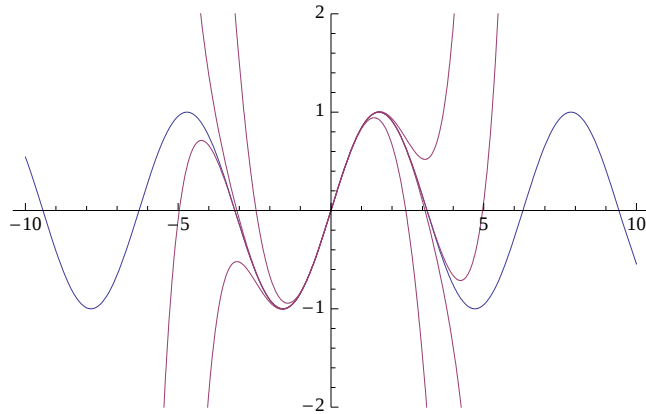
b)

Normal - funktio leikkaa sarjoista korkeamman asteen termejä kuvaavan osan (O[]) pois.

```
s = Table[Normal[Series[Sin[x], {x, 0, i}]], {i, 3, 9, 2}]
```

$$\left\{ x - \frac{x^3}{6}, x - \frac{x^3}{6} + \frac{x^5}{120}, x - \frac{x^3}{6} + \frac{x^5}{120} - \frac{x^7}{5040}, x - \frac{x^3}{6} + \frac{x^5}{120} - \frac{x^7}{5040} + \frac{x^9}{362880} \right\}$$

```
Plot[{Sin[x], s[[All]]}, {x, -10, 10}, PlotRange -> {-2, 2}]
```



c)

```
s2 = Normal[Series[Exp[x] / (x - 1), {x, 1, 10}]]
```

$$e + \frac{e}{-1+x} + \frac{1}{2} e (-1+x) + \frac{1}{6} e (-1+x)^2 + \frac{1}{24} e (-1+x)^3 + \frac{1}{120} e (-1+x)^4 + \frac{1}{720} e (-1+x)^5 + \frac{e (-1+x)^6}{5040} + \frac{e (-1+x)^7}{40320} + \frac{e (-1+x)^8}{362880} + \frac{e (-1+x)^9}{3628800} + \frac{e (-1+x)^{10}}{39916800}$$

```
Plot[s2, {x, -2, 10}]
```

