Изпит-Георги Г.-2001261019

Генериране на данни

In[ ]:=
```
xt = Table[1 + i * 0.5, {i, -5, 5}]
```
Out[ ]=
```
{-1.5, -1., -0.5, 0., 0.5, 1., 1.5, 2., 2.5, 3., 3.5}
```

In[ ]:=
```
f[x_] := x - 10 Cos[x]
```

In[ ]:=
```
yt = f[xt]
```
Out[ ]=
```
{-2.20737, -6.40302, -9.27583, -10., -8.27583,
 -4.40302, 0.792628, 6.16147, 10.5114, 12.8999, 12.8646}
```

In[ ]:= xt^2

Out[ ]=
```
{2.25, 1., 0.25, 0., 0.25, 1., 2.25, 4., 6.25, 9., 12.25}
```

In[ ]:=
```
yt * xt
```
Out[ ]=
```
{3.31106, 6.40302, 4.63791, 0., -4.13791,
 -4.40302, 1.18894, 12.3229, 26.2786, 38.6998, 45.026}
```

In[ ]:= xt^3

Out[ ]=
```
{-3.375, -1., -0.125, 0., 0.125, 1., 3.375, 8., 15.625, 27., 42.875}
```

In[ ]:= xt^4

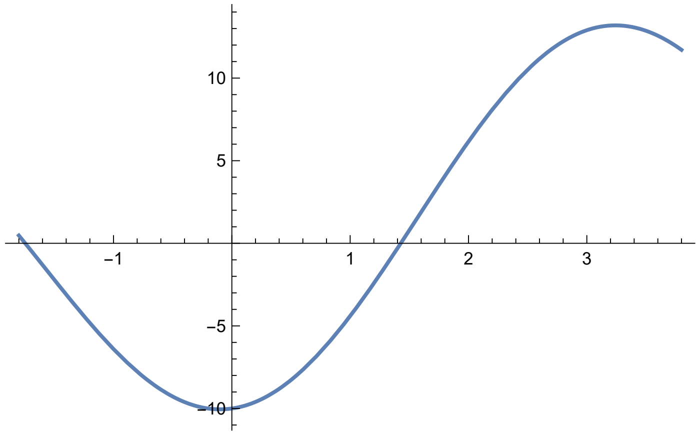
Out[ ]=
```
{5.0625, 1., 0.0625, 0., 0.0625, 1., 5.0625, 16., 39.0625, 81., 150.063}
```

In[ ]:= $yt * xt^2$

Out[ ]=
```
{-4.96659, -6.40302, -2.31896, 0., -2.06896,
 -4.40302, 1.78341, 24.6459, 65.6965, 116.099, 157.591}
```

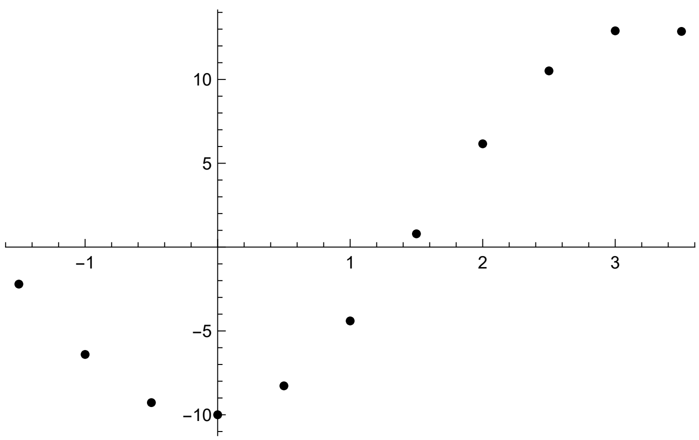
In[ ]:=
```
P = Length[xt]
```
Out[ ]=
```
11
```

In[ ]:=
```
grf = Plot[f[x], {x, xt⟦1⟧ - 0.3, xt⟦P⟧ + 0.3}]
```
Out[ ]=



In[ ]:=
```
points = Table[{xt⟦i⟧, yt⟦i⟧}, {i, 1, P}];
```

In[ ]:=
```
grp = ListPlot[points, PlotStyle → Black]
```
Out[ ]=



Линейна регресия

Попълваме таблицата

In[ ]:=
```
xt^2
```
Out[ ]=
```
{2.25, 1., 0.25, 0., 0.25, 1., 2.25, 4., 6.25, 9., 12.25}
```

In[ ]:=
```
yt * xt
```
Out[ ]=
```
{3.31106, 6.40302, 4.63791, 0., -4.13791,
 -4.40302, 1.18894, 12.3229, 26.2786, 38.6998, 45.026}
```

Решаваме системата

In[∘]:=
$$A = \begin{pmatrix} P & \sum_{i=1}^{P} xt[[i]] \\ \sum_{i=1}^{P} xt[[i]] & \sum_{i=1}^{P} xt[[i]]^2 \end{pmatrix}; \; b = \left\{\sum_{i=1}^{P} yt[[i]], \; \sum_{i=1}^{P} yt[[i]] * xt[[i]]\right\};$$

In[∘]:= **LinearSolve[A, b]**

Out[∘]=

{0.49398, 0.0365801}

Съставяме полинома

In[∘]:= **P1[x_] := 0.49398 + 0.0365801 x**

Таен коз (възможност за самопроверка)

In[∘]:= **Fit[points, {1, x}, x]**

Out[∘]=

0.49398 + 0.0365801 x

In[∘]:= **P1[-8.25]**

Out[∘]=

0.192194

За сравнение истинската стойност

In[∘]:= **f[-8.25]**

Out[∘]=

0.19205

Квадратична регресия

Попълваме таблицата

In[∘]:= xt^2

Out[∘]=

{2.25, 1., 0.25, 0., 0.25, 1., 2.25, 4., 6.25, 9., 12.25}

In[∘]:= **yt * xt**

Out[∘]=

{3.31106, 6.40302, 4.63791, 0., -4.13791,
-4.40302, 1.18894, 12.3229, 26.2786, 38.6998, 45.026}

In[∘]:= xt^3

Out[∘]=

{-3.375, -1., -0.125, 0., 0.125, 1., 3.375, 8., 15.625, 27., 42.875}

In[∘]:= xt^4

Out[∘]=

{5.0625, 1., 0.0625, 0., 0.0625, 1., 5.0625, 16., 39.0625, 81., 150.063}

In[∘]:= $yt * xt^2$

Out[∘]=

{-4.96659, -6.40302, -2.31896, 0., -2.06896,
 -4.40302, 1.78341, 24.6459, 65.6965, 116.099, 157.591}

Намиране на сумите

In[∘]:= $\sum_{i=1}^{P} xt[[i]]$

Out[∘]=

11.

In[∘]:= $\sum_{i=1}^{P} yt[[i]]$

Out[∘]=

2.66495

In[∘]:= $\sum_{i=1}^{P} xt[[i]]^2$

Out[∘]=

38.5

In[∘]:= $\sum_{i=1}^{P} yt[[i]] * xt[[i]]$

Out[∘]=

129.327

In[∘]:= $\sum_{i=1}^{P} xt[[i]]^3$

Out[∘]=

93.5

In[∘]:= $\sum_{i=1}^{P} xt[[i]]^4$

Out[∘]=

298.375

In[∘]:= $\sum_{i=1}^{P} yt[[i]] * xt[[i]]^2$

Out[∘]=

345.655

Решаваме системата

In[∘]:= $A = \begin{pmatrix} P & \sum_{i=1}^{P} xt[[i]] & \sum_{i=1}^{P} xt[[i]]^2 \\ \sum_{i=1}^{P} xt[[i]] & \sum_{i=1}^{P} xt[[i]]^2 & \sum_{i=1}^{P} xt[[i]]^3 \\ \sum_{i=1}^{P} xt[[i]]^2 & \sum_{i=1}^{P} xt[[i]]^3 & \sum_{i=1}^{P} xt[[i]]^4 \end{pmatrix}$; $b = \left\{\sum_{i=1}^{P} yt[[i]],\ \sum_{i=1}^{P} yt[[i]] * xt[[i]],\ \sum_{i=1}^{P} yt[[i]] * xt[[i]]^2\right\}$;

In[∘]:= **LinearSolve[A, b]**

Out[∘]=

{-6.68541, 1.5102, 1.54785}

Таен коз (възможност за самопроверка)

In[∘]:= **Clear[x]**

In[∘]:= **Fit[points, {1, x, x^2}, x]**

Out[∘]=

$-6.68541 + 1.5102\, x + 1.54785\, x^2$

Съставяме полинома

In[∘]:= $P2[x\_] := -6.68541 + 1.5102\, x + 1.54785\, x^2$

Оценка на грешката

Теоретична грешка (средноквадратична)

In[∘]:= $\sqrt{\sum_{i=1}^{P} (yt[[i]] - P2[xt[[i]]])^2}$

Out[∘]=

9.39459

Намиране на приближена стойност

In[∘]:= $s = 1 + (-1)^9 * (0.23) * 9 + 0.01$

Out[∘]=

-1.06

In[∘]:= **f[-1.06]**

Out[∘]=

-5.94872