Определение деформированного состояния методом координатной сетки.

Ввод координат сетки.

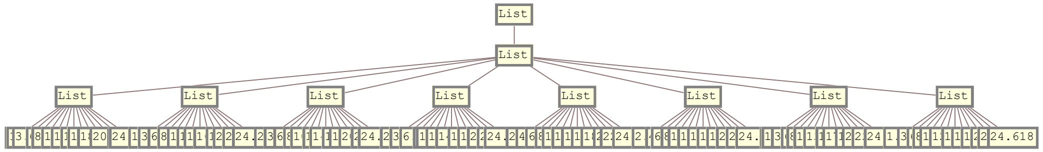
Xlist - данные по координате X после деформации;
Zlist - данные по координате Z после деформации;
Xnlist - данные по координате X до деформации.

```
Xlist = Import["C:\\Users\\Денис\\Desktop\\Уч. файлы\\Диплом\\x.xlsx"]
Zlist = Import["C:\\Users\\Денис\\Desktop\\Уч. файлы\\Диплом\\z.xlsx"]
Xnlist = Import["C:\\Users\\Денис\\Desktop\\Уч. файлы\\Диплом\\Xн.xlsx"]
```

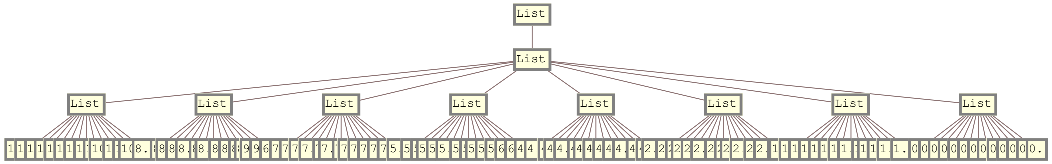
- Вывод массива чисел в табличную форму.Определение иерархии.

```
TableForm[Xlist]
TreeForm[Xlist]
TableForm[Zlist]
TreeForm[Zlist]
TableForm[Xnlist]
TreeForm[Xnlist]
```

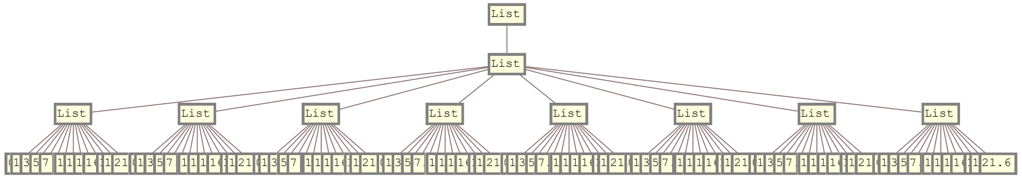
0.	0.	0.	0.	0.	0.	0.	0.
1.76	1.958	2.002	2.046	2.068	2.024	1.98	1.782
3.938	3.982	3.982	3.982	4.026	4.07	3.96	3.85
6.05	6.116	6.138	6.182	6.204	6.226	6.16	6.16
8.162	8.162	8.316	8.36	8.382	8.448	8.338	8.338
10.23	10.34	10.362	10.384	10.406	10.538	10.362	10.296
12.43	12.43	12.65	12.782	12.848	12.958	12.936	12.826
14.19	14.476	14.564	14.938	14.938	14.982	14.96	14.96
16.346	16.566	16.72	17.05	17.116	17.314	17.138	17.16
18.194	18.37	18.502	18.81	18.898	19.096	19.03	19.14
20.13	20.482	20.724	21.01	21.23	21.472	21.538	21.45
22.	22.396	22.55	22.77	22.858	22.836	22.836	22.858
24.09	24.376	24.486	24.794	24.86	24.816	24.86	24.618



10.23	8.712	6.996	5.742	4.048	2.574	1.342	0.
10.23	8.8	7.062	5.72	4.092	2.53	1.342	0.
10.23	8.91	7.238	5.61	4.07	2.53	1.298	0.
10.23	8.91	7.238	5.566	4.158	2.508	1.298	0.
10.23	8.91	7.238	5.544	4.114	2.618	1.342	0.
10.23	8.8	7.26	5.698	4.18	2.596	1.364	0.
10.23	8.91	7.304	5.72	4.202	2.64	1.364	0.
10.23	8.8	7.26	5.83	4.136	2.75	1.386	0.
10.23	8.8	7.238	5.698	4.202	2.596	1.32	0.
10.296	8.8	7.282	5.874	4.356	2.904	1.518	0.
10.34	8.91	7.238	5.896	4.356	2.75	1.496	0.
10.56	9.042	7.458	6.006	4.51	2.86	1.518	0.
10.736	9.416	7.942	6.336	4.95	3.3	1.76	0.



0.	0.	0.	0.	0.	0.	0.	0.
1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2
9.	9.	9.	9.	9.	9.	9.	9.
10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
14.4	14.4	14.4	14.4	14.4	14.4	14.4	14.4
16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2
18.	18.	18.	18.	18.	18.	18.	18.
19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8
21.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6



Расчеты деформированного состояния по координатной сетке с квадратными до деформации ячейками.

■ Определение хорд.

Необходимые для расчетов числа строк и столбцов:

```
n1 = 7
n2 = 12
n3 = 6
```

Определение хорд соединяющих узлы сетки вокруг точки расчета:

```
lx =.
For[j = 2, j ≤ n2, j++, lx[j - 1] =
  Table[Sqrt[(Zlist[[1, i, j - 1]] - Zlist[[1, i, j + 1]])^2 + (Xlist[[1, i, j + 1]] - Xlist[[1, i, j - 1]])^2], {i, 2, 7, 1}];
 lz[j - 1] = Table[Sqrt[(Zlist[[1, i + 1, j]] - Zlist[[1, i - 1, j]])^2 + (Xlist[[1, i + 1, j]] - Xlist[[1, i - 1, j]])^2],
   {i, 2, 7, 1}]]
```

■ Определение главных компонентов тензора деформации и интенсивность деформаций.

Габариты недеформированной стеки:

```
b = 1.8
```

Главные компоненты тензора деформаций:

```
For[j = 2, j ≤ n2, j++, Ea[j - 1] = Table[
   Log[1 / 2 * (Sqrt[(lz[j - 1][[i - 1]] / (2 * b)) ^2 + (lx[j - 1][[i - 1]] / (2 * b)) ^2 + 2 * Xnlist[[1, i, j]] / Xlist[[1, i, j]]] +
       Sqrt[(lz[j - 1][[i - 1]] / (2 * b)) ^2 + (lx[j - 1][[i - 1]] / (2 * b)) ^2 -
         2 * Xnlist[[1, i, j]] / Xlist[[1, i, j]]])], {i, 2, 7, 1}]]
```

```
For[j = 2, j ≤ n2, j++, Eb[j - 1] = Table[
   Log[1 / 2 * (Sqrt[(lz[j - 1][[i - 1]] / (2 * b)) ^2 + (lx[j - 1][[i - 1]] / (2 * b)) ^2 + 2 * Xnlist[[1, i, j]] / Xlist[[1, i, j]]] -
       Sqrt[(lz[j - 1][[i - 1]] / (2 * b)) ^2 + (lx[j - 1][[i - 1]] / (2 * b)) ^2 -
         2 * Xnlist[[1, i, j]] / Xlist[[1, i, j]]])], {i, 2, 7, 1}]]
```

```
For[j = 1, j ≤ 11, j++, Ec[j] = Table[- (Ea[j][[i]] + Eb[j][[i]]), {i, 1, 6, 1}]]
```

Интенсивность деформаций:

```
For[j = 1, j ≤ 11, j++, Ei[j] = Table[Sqrt[Ec[j][[i]] ^2 + (1 / 3) * (Ea[j][[i]] - Eb[j][[i]]) ^2], {i, 1, 6, 1}]]
```

Определение вспомогательных углов.

```
For[j = 2, j ≤ n2, j++,
  kappa[j - 1] = Table[(ArcTan[(Xlist[[1, i + 1, j]] - Xlist[[1, i - 1, j]]) / (Zlist[[1, i + 1, j]] - Zlist[[1, i - 1, j]])] +
      ArcTan[(Zlist[[1, i, j - 1]] - Zlist[[1, i, j + 1]]) / (Xlist[[1, i, j + 1]] - Xlist[[1, i, j - 1]])]), {i, 2, 7, 1}]]
For[j = 2, j ≤ n2, j++, gamma[j - 1] = Table[
   (ArcTan[(Xlist[[1, i + 1, j]] - Xlist[[1, i - 1, j]]) / (Zlist[[1, i + 1, j]] - Zlist[[1, i - 1, j]])] -
     ArcTan[(Zlist[[1, i, j - 1]] - Zlist[[1, i, j + 1]]) / (Xlist[[1, i, j + 1]] - Xlist[[1, i, j - 1]])]), {i, 2, 7, 1}]]
```

Определение угла между осью симметрии и направлением главной оси.

```
For[j = 1, j ≤ 11, j++, alfa[j] = Table[Pi + kappa[j][[i]] +
     ArcTan[(((lx[j][[i]]) ^2 + (lz[j][[i]]) ^2) / ((lz[j][[i]]) ^2 - (lx[j][[i]]) ^2)) * Tan[gamma[j][[i]]]], {i, 1, 6, 1}]]
```

■ Компоненты тензора деформации в системе координат XYZ. Вывод таблицы.

```
For[j = 1, j ≤ 11, j++, Ez[j] = Table[1/2 * (-Ec[j][[i]] + (Ea[j][[i]] - Eb[j][[i]]) * Cos[alfa[j][[i]]]), {i, 1, 6, 1}]]

For[j = 1, j ≤ 11, j++, Ex[j] = Table[1/2 * (-Ec[j][[i]] - (Ea[j][[i]] - Eb[j][[i]]) * Cos[alfa[j][[i]]]), {i, 1, 6, 1}]]

For[j = 1, j ≤ 11, j++, Tbl[j] = {lx[j], lz[j], Ea[j], Eb[j], Ec[j], Ei[j], Ex[j], Ez[j], gamma[j], kappa[j], alfa[j]}]

For[i = 1, i ≤ 11, i++, Print[i,
  TableForm[Tbl[i], TableDirections → Row, TableHeadings → {{Lx, Lz, Ea, Eb, Ec, Ei, Ex, Ez, gamma, kappa, 2 alfa}, {}}]]]
```

1

Lx	Lz	Ea	Eb	Ec	Ei	
3.98692	3.17723	0.169342	-0.253479	0.0841369	0.258209	0.1(
3.98935	3.08126	0.157734	-0.264094	0.10636	0.265755	0.1!
3.98419	2.97073	0.138429	-0.266529	0.1281	0.266596	0.1:
4.02606	3.19008	0.217785	-0.35658	0.138795	0.359485	0.2:
4.07024	2.75141	0.0942179	-0.211507	0.117289	0.211926	0.0!
3.96024	2.54155	-0.0476551 + 0.174507 i	-0.0476551 - 0.174507 i	0.0953102 + 0. i	0. + 0.177537 i	-0.0476551 + 0.173

2

Lx	Lz	Ea	Eb	Ec	Ei	Ex	Ez	gamma	kappa
4.15945	2.99232	0.192544	-0.293394	0.10085	0.298132	0.191804	-0.292654	0.011744	-0.0411537
4.13974	3.3	0.257759	-0.358609	0.10085	0.369875	0.249562	-0.350412	0.0425275	-0.0425275
4.13887	3.16831	0.228252	-0.329102	0.10085	0.337222	0.221727	-0.322577	-0.0511048	0.0233289
4.13653	3.08126	0.212762	-0.324602	0.111839	0.32979	0.212762	-0.324602	-0.0126076	-0.0445198
4.20206	2.77279	0.16635	-0.289059	0.122709	0.290155	0.166312	-0.289021	0.0185695	0.0290406
4.18023	2.53955	0.0396347	-0.134945	0.0953102	0.13872	0.0394392	-0.134749	0.0762124	0.0972643

3

Lx	Lz	Ea	Eb	Ec	Ei	Ex	Ez	gamma	kappa
4.18	2.99329	0.212635	-0.337144	0.124509	0.340962	0.212112	-0.336622	-0.0294033	-0.0294033
4.334	3.34465	0.32265	-0.45075	0.1281	0.464534	0.322	-0.4501	-0.0197343	-0.0197343
4.3785	3.08071	0.289384	-0.424627	0.135243	0.433852	0.287552	-0.422795	-0.0364995	-0.00635106
4.35622	3.05832	0.280958	-0.419754	0.138795	0.427703	0.280934	-0.419729	-0.00428683	-0.0244882
4.37888	2.86034	0.252431	-0.394767	0.142335	0.399851	0.251039	-0.393374	0.0354812	-0.00471439
4.37822	2.50887	0.177357	-0.309035	0.131678	0.310158	0.176981	-0.308659	0.0363596	0.0162598

4

Lx	Lz	Ea	Eb	Ec	Ei	Ex	Ez	gamma	kappa	
4.22543	2.99596	0.227658	-0.353066	0.125408	0.357967	0.221578	-0.346986	-0.077461	-0.0253894	3
4.22406	3.37182	0.307178	-0.451279	0.1441	0.460996	0.301495	-0.445595	-0.0535475	-0.0639641	3
4.20407	3.1247	0.257621	-0.406998	0.149377	0.411768	0.25633	-0.405707	0.0102797	-0.0525269	3
4.20206	2.92732	0.218015	-0.370021	0.152006	0.371978	0.217822	-0.369828	-0.0248306	-0.0353017	3
4.3129	2.77235	0.223573	-0.383421	0.159849	0.385182	0.222297	-0.382146	0.036277	-0.00453365	3
4.20252	2.62031	0.143809	-0.290552	0.146742	0.290557	0.142631	-0.289374	0.0576976	0.0262866	3

5

Lx	Lz	Ea	Eb	Ec	Ei	Ex	Ez	gamma	kappa	2
4.268	2.97293	0.241149	-0.379944	0.138795	0.384513	0.240077	-0.378873	-0.0444152	-0.0444152	3
4.3345	3.10231	0.284032	-0.424953	0.140921	0.432911	0.283843	-0.424764	0.0010438	-0.0294107	3.
4.4255	3.08031	0.303152	-0.446193	0.143042	0.455668	0.300117	-0.443159	0.0254953	-0.0540647	3.
4.46687	3.10582	0.31765	-0.462808	0.145158	0.473401	0.317597	-0.462755	-0.0299028	-0.0693065	3.
4.51005	2.81634	0.285275	-0.443038	0.157763	0.449113	0.28504	-0.442803	0.0205017	0.0107457	3.
4.59805	2.60726	0.270088	-0.411009	0.140921	0.41772	0.268369	-0.409289	0.0977364	0.0881671	3.

6

Lx	Lz	Ea	Eb	Ec	Ei	Ex	Ez	gamma	kappa	2
4.136	2.93426	0.193013	-0.33358	0.140567	0.334952	0.190107	-0.330674	-0.0750468	-0.0750468	3
4.202	3.20936	0.276281	-0.434392	0.158111	0.439717	0.261732	-0.419843	-0.1099	-0.1099	3.
4.55591	3.10831	0.343549	-0.512041	0.168492	0.52192	0.343548	-0.512039	-0.0347659	-0.0927207	3.
4.53221	3.08502	0.336098	-0.50974	0.173642	0.518297	0.332361	-0.506003	-0.0667892	-0.0473723	3.
4.44667	2.83936	0.280104	-0.462271	0.182167	0.465717	0.27908	-0.461247	0.00364178	-0.0656374	3
4.59805	2.6433	0.287899	-0.468367	0.180468	0.472457	0.287142	-0.46761	0.054743	0.0451737	3

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Lx	Lz	Ea	Eb	Ec	Ei	Ex	Ez	gamma	kappa	
4.13746	2.99346	0.206338	-0.345133	0.138795	0.347329	0.189018	-0.327814	-0.151856	-0.0986771	3
4.07054	3.00572	0.190759	-0.335615	0.144856	0.33666	0.170863	-0.315719	-0.170534	-0.138104	3
4.26806	3.14631	0.284557	-0.454768	0.170211	0.459535	0.269576	-0.439788	-0.124306	-0.113997	3
4.268	3.08031	0.272698	-0.442909	0.170211	0.446844	0.272525	-0.442737	-0.0142847	-0.0142847	3
4.35622	2.75009	0.237475	-0.410628	0.173153	0.412304	0.237159	-0.410312	-0.0181005	0.00210084	3
4.20223	2.75009	0.189344	-0.361027	0.171683	0.361171	0.18926	-0.360944	-0.00247099	0.0184707	3

8

Lx	Lz	Ea	Eb	Ec	Ei	Ex	Ez	gamma	kappa	
3.894	3.01528	0.124321	-0.264445	0.140124	0.264603	0.113271	-0.253395	-0.124355	-0.124355	3
3.93806	3.13953	0.183442	-0.332819	0.149377	0.3334	0.159607	-0.308985	-0.149194	-0.160367	
3.87225	3.06172	0.151209	-0.320131	0.168922	0.320294	0.138114	-0.307036	-0.118339	-0.141066	3
3.96611	3.11321	0.197677	-0.370462	0.172785	0.370741	0.197635	-0.37042	-0.0294033	-0.1404	
4.11688	2.88208	0.196672	-0.380959	0.184287	0.381026	0.194163	-0.378451	0.0297822	-0.0450491	3
4.07214	2.60056	0.101474	-0.275544	0.17407	0.278714	0.0981404	-0.27221	0.0916737	0.0268315	2

9

Lx	Lz	Ea	Eb	Ec	Ei	Ex	Ez	gamma	kappa	
3.91754	3.0297	0.127021	-0.252728	0.125708	0.252729	0.12472	-0.250427	-0.0737538	-0.129919	3
4.004	2.9589	0.146636	-0.279504	0.132868	0.279617	0.135542	-0.26841	-0.149258	-0.149258	3
3.96495	2.95268	0.141312	-0.290689	0.149377	0.290726	0.140164	-0.289541	-0.0845626	-0.184479	3
4.11688	2.98374	0.205101	-0.359146	0.154045	0.360354	0.204708	-0.358752	-0.0585846	-0.133416	3
4.16085	2.84107	0.192164	-0.356631	0.164468	0.35699	0.19171	-0.356177	-0.00945802	-0.0834982	3
4.40352	2.90433	0.273366	-0.434372	0.161005	0.439189	0.270901	-0.431906	0.0248283	-0.055129	3

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Lx	Lz	Ea	Eb	Ec	Ei	Ex	Ez	gamma	kappa
4.03327	3.15836	0.207756	-0.336931	0.129175	0.339971	0.199475	-0.32865	-0.129162	-0.249236
4.05182	3.0599	0.195759	-0.33668	0.140921	0.338165	0.188824	-0.329745	-0.129972	-0.216874
3.9622	2.92608	0.136136	-0.290763	0.154627	0.290959	0.129969	-0.284596	-0.14048	-0.207122
3.96299	3.17974	0.208899	-0.373943	0.165044	0.374799	0.197929	-0.362972	-0.106942	-0.18468
3.74026	2.87654	0.0225634	-0.198941	0.176378	0.217862	0.0162038	-0.192582	-0.119043	-0.0955147
3.806	2.75009	0.00458095	-0.184028	0.179447	0.209902	0.00456655	-0.184014	0.00799983	0.00799983

11

Lx	Lz	Ea	Eb	Ec	Ei	
3.92674	3.15038	0.166613	-0.289813	0.1232	0.290895	0.1
3.8273	3.05895	0.0997046	-0.229758	0.130053	0.230425	0.07
3.8095	2.96405	0.0594906	-0.199253	0.139762	0.204571	0.05
3.67828	3.14669	0.0753168	-0.218936	0.143619	0.222459	0.01
3.38893	2.99208	-0.0713282 + 0.214503 i	-0.0713282 - 0.214503 i	0.142656 + 0. i	0. + 0.20248 i	-0.0713282 + 0.0968
3.33247	2.86008	-0.0713282 + 0.269596 i	-0.0713282 - 0.269596 i	0.142656 + 0. i	0. + 0.276692 i	-0.0713282 + 0.23

Определение главныйх напряжений, среднего напряжения и интенсивности напряжения. Вывод графиков.

■ Определение напряжений.

Характеристики материала АД31. Определение интенсивности напряжений:

```
B = 140
G = 27
h = 0.12
μ = 0.31
For[j = 1, j ≤ 11, j++, σi[j] = Table[B * Ei[j][[i]]^h, {i, 1, 6, 1}]]
```

Определение средних напряжений:

```
For[j = 1, j ≤ 11, j++, σcp[j] = Table[- (Ex[j][[i]] + Ez[j][[i]]) * (2 * (1 + μ) * G) / (1 - 2 * μ), {i, 1, 6, 1}]]
```

Напряжение по главным осям:

```
For[j = 1, j ≤ 11, j++,
 σx[j] = Table[2 / 3 * σi[j][[i]] / Ei[j][[i]] * (Ex[j][[i]] - (1 - 2 μ) / G * σcp[j][[i]]) + σcp[j][[i]], {i, 1, 6, 1}]]
For[j = 1, j ≤ 11, j++,
 σz[j] = Table[2 / 3 * σi[j][[i]] / Ei[j][[i]] * (Ez[j][[i]] - (1 - 2 μ) / G * σcp[j][[i]]) + σcp[j][[i]], {i, 1, 6, 1}]]
For[j = 1, j ≤ 11, j++, σr[j] = Table[3 * σcp[j][[i]] - σz[j][[i]] - σx[j][[i]], {i, 1, 6, 1}]]
```

Создание и вывод таблиц.

```
For[j = 1, j ≤ 11, j++, Tbl2[j] = {σi[j], σcp[j], σx[j], σz[j], σr[j]}]
For[i = 1, i ≤ 11, i++, Print[i, TableForm[Tbl2[i], TableDirections → Row, TableHeadings → {{σi, σcp, σx, σz, σr}, {}}]]]
```

1

σi	σcp	σx	σz	σr
119.005	15.6627	-0.0387874	-129.95	176.977
119.417	19.7998	-17.892	-141.327	218.618
119.462	23.8468	-36.2999	-154.798	262.639
123.825	25.8378	-7.74751	-139.46	224.721
116.217	21.8343	-56.071	-167.83	289.404
111.759 + 21.3191 i	17.7427 + 0. i	66.8508 + 138.703 i	-78.9769 + 110.885 i	65.3544 - 249.589 i

2

σi	σcp	σx	σz	σr
121.076	18.7741	-0.834268	-131.998	189.154
124.249	18.7741	15.4896	-118.874	159.706
122.879	18.7741	8.44951	-123.775	171.648
122.551	20.8198	0.937251	-132.187	193.709
120.682	22.8433	-20.187	-146.443	235.16
110.455	17.7427	-93.8761	-186.34	333.444

	σi	σcp	σx	σz	σr
3	123.042	23.1784	-4.27202	-136.285	210.093
	127.694	23.8468	21.3506	-120.142	170.332
	126.651	25.1765	12.1794	-126.065	189.415
	126.434	25.8378	9.53778	-128.545	196.521
	125.417	26.4968	1.0111	-133.739	212.219
	121.652	24.5129	-19.4201	-146.407	239.366

	σi	σcp	σx	σz	σr
4	123.763	23.3457	-1.31486	-132.364	203.716
	127.577	26.8254	12.795	-125.039	192.72
	125.86	27.8078	0.290784	-134.613	217.746
	124.334	28.297	-11.9094	-142.858	239.658
	124.856	29.7571	-12.7076	-143.326	245.305
	120.702	27.3172	-39.6574	-159.299	280.908

	σi	σcp	σx	σz	σr
5	124.83	25.8378	-0.905514	-134.864	213.283
	126.618	26.2335	9.5877	-128.582	197.694
	127.399	26.6283	12.7138	-125.826	192.997
	127.984	27.0223	15.7187	-124.927	190.275
	127.178	29.3689	5.14805	-132.257	215.215
	126.077	26.2335	5.94239	-130.412	203.17

	σi	σcp	σx	σz	σr
6	122.78	26.1676	-17.3741	-144.639	240.516
	126.855	29.4336	0.0997629	-130.986	219.188
	129.491	31.3661	15.1729	-126.344	205.27
	129.383	32.3248	11.9248	-127.596	212.646
	127.733	33.9119	-2.32817	-137.695	241.759
	127.953	33.5955	0.0702572	-136.201	236.917

	σi	σcp	σx	σz	σr
7	123.315	25.8378	-15.4947	-137.825	230.833
	122.854	26.9661	-23.7968	-142.173	246.868
	127.528	31.6862	-0.945567	-132.185	228.19
	127.1	31.6862	-1.20052	-136.833	233.092
	125.879	32.2337	-11.8325	-143.617	252.151
	123.895	31.9602	-27.6252	-153.452	276.958

	σi	σcp	σx	σz	σr
8	119.355	26.0852	-50.2523	-160.514	289.022
	122.711	27.8078	-29.0603	-144.04	256.524
	122.122	31.4462	-45.944	-159.096	299.378
	124.284	32.1654	-24.8383	-151.792	273.126
	124.693	34.3065	-28.6727	-153.6	285.193
	120.101	32.4045	-70.4177	-176.81	344.441

	σi	σcp	σx	σz	σr
9	118.699	23.4015	-40.6721	-158.135	269.012
	120.148	24.7344	-36.1583	-151.874	262.235
	120.711	27.8078	-41.7265	-160.67	285.82
	123.861	28.6767	-16.8985	-146.014	248.942
	123.722	30.617	-24.6484	-151.236	267.735
	126.837	29.9724	0.912885	-134.4	223.404

	σi	σcp	σx	σz	σr
10	122.999	24.0469	-9.4701	-136.851	218.462
	122.92	26.2335	-17.4796	-143.143	239.323
	120.722	28.785	-47.3245	-161.997	295.676
	124.447	30.7242	-21.1809	-145.341	258.694
	116.603	32.8342	-126.27	-200.766	425.538
	116.083	33.4055	-138.251	-207.779	446.246

	σi	σcp	σx	σz	σr
11	120.719	22.9347	-20.5529	-146.267	235.624
	117.39	24.2104	-66.9225	-160.28	299.834
	115.726	26.0178	-91.3754	-185.491	354.92
	116.896	26.7359	-99.2569	-161.217	340.681
	113.536 + 21.6581 i	26.5566 + 0. i	31.026 + 173.289 i	-41.3908 + 159.474 i	90.0345 - 332.763 i
	117.871 + 22.4851 i	26.5566 + 0. i	68.5532 + 139.016 i	-63.666 + 113.794 i	74.7826 - 252.81 i

Создание и вывод графиков деформаций и напряжений.

```
σiTbl = Table[σi[i], {i, 1, 11, 1}]
TableForm[σiTbl]

σiTbl3 = Flatten[σiTbl]
xl = Import["C:\\Users\\Денис\\Desktop\\Уч. файлы\\Диплом\\x2.xlsx"]
zl = Import["C:\\Users\\Денис\\Desktop\\Уч. файлы\\Диплом\\z2.xlsx"]
xl2 = Flatten[xl]
zl2 = Flatten[zl]
xx2 = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
yy2 = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
zz2 = {65, 3, 45, 6, 5, 6, 4, 76, 6, 28}
```

```
ListContourPlot[Transpose[{xl2, zl2, σiTbl3}], ColorFunction → "Rainbow", PlotLegends → Automatic, AspectRatio → 1 / 2.5]
EiTbl = Table[Ei[i], {i, 1, 11, 1}]
ListContourPlot[Transpose[{xl2, zl2, Flatten[EiTbl]}],
 ColorFunction → "Rainbow", PlotLegends → Automatic, AspectRatio → 1 / 2.5]
ExTbl = Table[Ex[i], {i, 1, 11, 1}]
ListContourPlot[Transpose[{xl2, zl2, Flatten[ExTbl]}],
 ColorFunction → "Rainbow", PlotLegends → Automatic, AspectRatio → 1 / 2.5]
EzTbl = Table[Ez[i], {i, 1, 11, 1}]
ListContourPlot[Transpose[{xl2, zl2, Flatten[EzTbl]}],
 ColorFunction → "Rainbow", PlotLegends → Automatic, AspectRatio → 1 / 2.5]
σxTbl = Table[σx[i], {i, 1, 11, 1}]
ListContourPlot[Transpose[{xl2, zl2, Flatten[σxTbl]}],
 ColorFunction → "Rainbow", PlotLegends → Automatic, AspectRatio → 1 / 2.5]
σzTbl = Table[σz[i], {i, 1, 11, 1}]
ListContourPlot[Transpose[{xl2, zl2, Flatten[σzTbl]}],
 ColorFunction → "Rainbow", PlotLegends → Automatic, AspectRatio → 1 / 2.5]
```

Графики

График интенсивности напряжений

σi

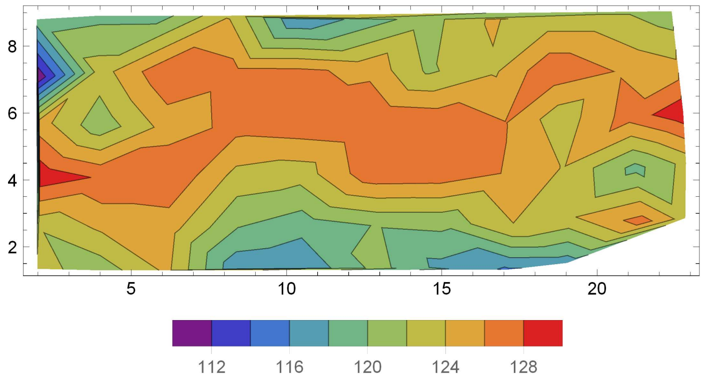


График интенсивности деформаций

```
Ei
```

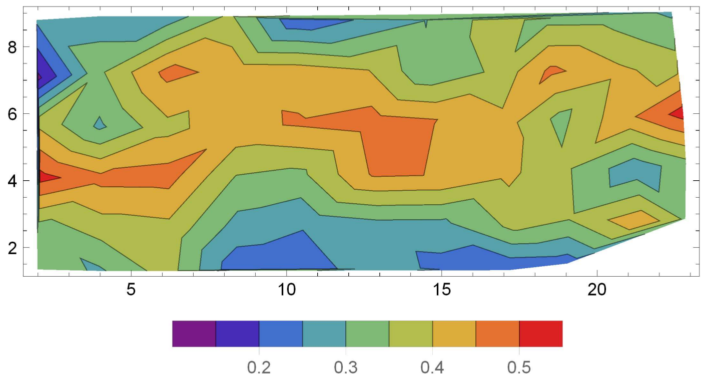


График деформаций по оси X

```
Ex
```

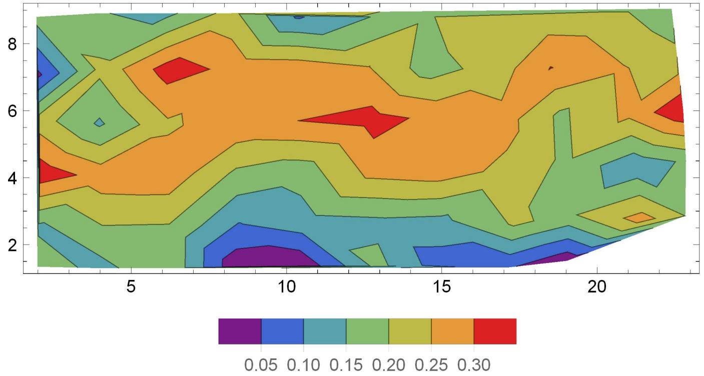


График деформаций по оис Z

Ez

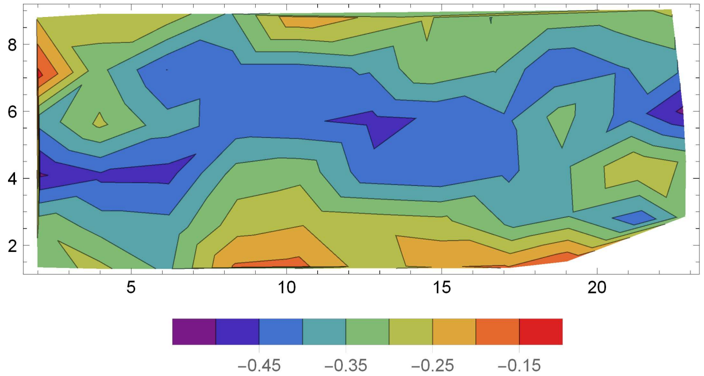


График напряжений по оси X

σx

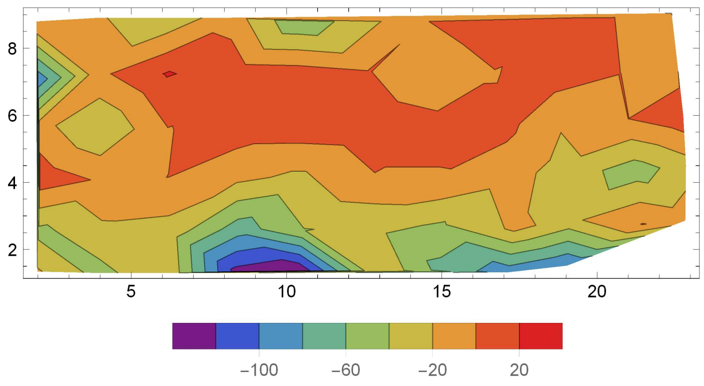
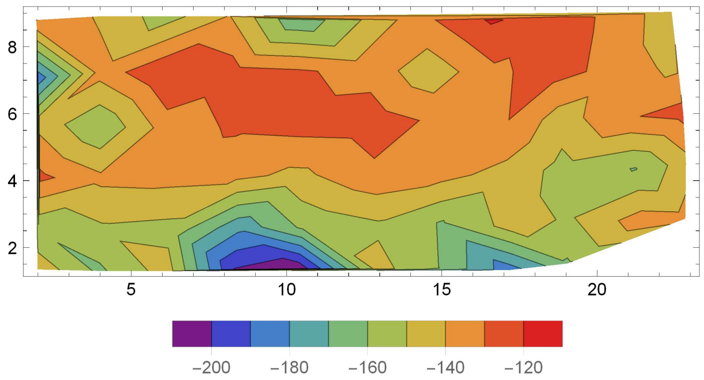


График напряжений по оси Z

σz



```
ListPlot[Transpose[{xl2, zl2}], AspectRatio → 1 / 2.5]
```