Zur Aufgabe 1 auf Seite 108 im Ashcroft

```
Needs["VectorAnalysis`"]
```

```
A = {1 / 2 {1, 0, 1}, {0, 0, 1}, {0, 1 / 2, 1 / 2}};
```

```
B = Inverse[Transpose[A] ]
```

```
{{2, 0, 0}, {-1, -1, 1}, {0, 2, 0}}
```

```
1 / 2 (A[[1]] + A[[3]] - A[[2]] / 2)
```

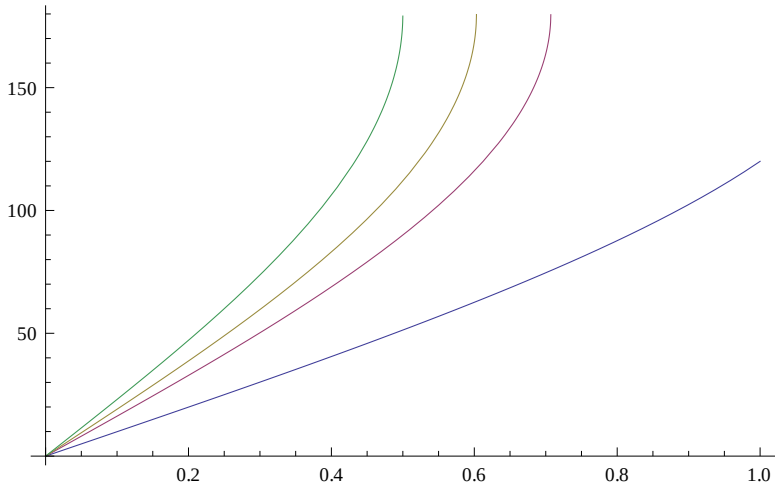
$$\left\{\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right\}$$

```
b = Sort[Transpose[
      Tally[Flatten[Table[Table[Table[Norm[h B[[1]] + k B[[2]] + l B[[3]]], {h, -5, 5}],
          {k, -5, 5}], {l, -5, 5}], 3]][[1]], #1 < #2 &][[2 ;; 5]]
```

$$\left\{\sqrt{3}\ ,\ 2,\ 2\sqrt{2}\ ,\ \sqrt{11}\ \right\}$$

```
T = 2 ArcSin[x / 2 * b] / Pi * 180;
```

```
Plot[{T}, {x, 0, 1}]
```




```
Solve[T[[1]] == 42.8, x]
T /. %
```

```
{{x → 0.421323}}
```

```
{{42.8, 73.1453, 88.6433, 114.841}}
```

```
1.5 / 0.4156885081510353
```

```
3.60847
```

```
Sort[
  Transpose[Tally[Flatten[Table[Table[Table[ {Abs[1 + Exp[I Pi / 2 (h + l - k 2)]], Norm[
            h B[[1]] + k B[[2]] + l B[[3]]]}, {h, -5, 5}],
        {k, -5, 5}], {l, -5, 5}], 2]][[1]], #1[[2]] < #2[[2]] &]
```

$$\{\{2, 0\}, \{0, \sqrt{3}\}, \{\sqrt{2}, \sqrt{3}\}, \{2, \sqrt{3}\}, \{\sqrt{2}, 2\}, \{0, 2\}, \{2, 2\sqrt{2}\}, \{0, 2\sqrt{2}\},$$
$$\{\sqrt{2}, 2\sqrt{2}\}, \{2, \sqrt{11}\}, \{\sqrt{2}, \sqrt{11}\}, \{0, \sqrt{11}\}, \{0, 2\sqrt{3}\}, \{2, 2\sqrt{3}\}, \{0, 4\},$$
$$\{2, 4\}, \{2, \sqrt{19}\}, \{0, \sqrt{19}\}, \{\sqrt{2}, \sqrt{19}\}, \{2, 2\sqrt{5}\}, \{\sqrt{2}, 2\sqrt{5}\}, \{\sqrt{2}, 2\sqrt{6}\},$$
$$\{2, 2\sqrt{6}\}, \{0, 2\sqrt{6}\}, \{0, 3\sqrt{3}\}, \{\sqrt{2}, 3\sqrt{3}\}, \{2, 3\sqrt{3}\}, \{2, 4\sqrt{2}\}, \{0, 4\sqrt{2}\},$$
$$\{0, \sqrt{35}\}, \{2, \sqrt{35}\}, \{\sqrt{2}, \sqrt{35}\}, \{0, 6\}, \{\sqrt{2}, 6\}, \{0, 2\sqrt{10}\}, \{2, 2\sqrt{10}\},$$
$$\{\sqrt{2}, 2\sqrt{10}\}, \{2, \sqrt{43}\}, \{\sqrt{2}, \sqrt{43}\}, \{0, \sqrt{43}\}, \{2, 2\sqrt{11}\}, \{0, 2\sqrt{11}\},$$
$$\{2, 4\sqrt{3}\}, \{2, \sqrt{51}\}, \{\sqrt{2}, \sqrt{51}\}, \{0, \sqrt{51}\}, \{\sqrt{2}, 2\sqrt{13}\}, \{\sqrt{2}, 2\sqrt{14}\},$$
$$\{0, 2\sqrt{14}\}, \{2, 2\sqrt{14}\}, \{0, \sqrt{59}\}, \{2, \sqrt{59}\}, \{\sqrt{2}, \sqrt{59}\}, \{2, 8\}, \{2, \sqrt{67}\},$$
$$\{\sqrt{2}, \sqrt{67}\}, \{0, \sqrt{67}\}, \{0, 2\sqrt{17}\}, \{\sqrt{2}, 2\sqrt{17}\}, \{2, 6\sqrt{2}\}, \{0, 6\sqrt{2}\},$$
$$\{\sqrt{2}, 6\sqrt{2}\}, \{0, 5\sqrt{3}\}, \{\sqrt{2}, 5\sqrt{3}\}, \{2, 5\sqrt{3}\}, \{0, 2\sqrt{19}\}, \{2, 2\sqrt{19}\},$$
$$\{2, 4\sqrt{5}\}, \{0, 4\sqrt{5}\}, \{2, \sqrt{83}\}, \{0, \sqrt{83}\}, \{\sqrt{2}, \sqrt{83}\}, \{\sqrt{2}, 2\sqrt{21}\},$$
$$\{2, 2\sqrt{21}\}, \{2, 2\sqrt{22}\}, \{0, 2\sqrt{22}\}, \{2, \sqrt{91}\}, \{0, \sqrt{91}\}, \{\sqrt{2}, \sqrt{91}\}, \{0, 4\sqrt{6}\},$$
$$\{2, 3\sqrt{11}\}, \{\sqrt{2}, 3\sqrt{11}\}, \{0, 3\sqrt{11}\}, \{\sqrt{2}, 10\}, \{2, 2\sqrt{26}\}, \{0, 2\sqrt{26}\},$$
$$\{\sqrt{2}, 2\sqrt{26}\}, \{0, \sqrt{107}\}, \{\sqrt{2}, \sqrt{107}\}, \{2, \sqrt{107}\}, \{0, 6\sqrt{3}\}, \{2, 6\sqrt{3}\},$$
$$\{0, \sqrt{115}\}, \{\sqrt{2}, \sqrt{115}\}, \{2, \sqrt{115}\}, \{\sqrt{2}, 2\sqrt{29}\}, \{0, 2\sqrt{30}\}, \{2, 2\sqrt{30}\},$$
$$\{\sqrt{2}, 2\sqrt{30}\}, \{2, \sqrt{123}\}, \{0, \sqrt{123}\}, \{\sqrt{2}, \sqrt{123}\}, \{2, 8\sqrt{2}\}, \{0, \sqrt{131}\},$$
$$\{2, \sqrt{131}\}, \{\sqrt{2}, \sqrt{131}\}, \{\sqrt{2}, 2\sqrt{33}\}, \{0, 2\sqrt{33}\}, \{0, 2\sqrt{34}\}, \{2, 2\sqrt{34}\},$$
$$\{\sqrt{2}, \sqrt{139}\}, \{0, \sqrt{139}\}, \{2, \sqrt{139}\}, \{0, 2\sqrt{35}\}, \{2, 2\sqrt{35}\}, \{2, 12\}, \{0, 7\sqrt{3}\},$$
$$\{2, 7\sqrt{3}\}, \{\sqrt{2}, 7\sqrt{3}\}, \{2, 2\sqrt{37}\}, \{2, 2\sqrt{38}\}, \{\sqrt{2}, 2\sqrt{38}\}, \{0, 2\sqrt{38}\},$$
$$\{2, \sqrt{155}\}, \{0, \sqrt{155}\}, \{\sqrt{2}, \sqrt{155}\}, \{0, 4\sqrt{10}\}, \{0, \sqrt{163}\}, \{\sqrt{2}, \sqrt{163}\},$$
$$\{2, \sqrt{163}\}, \{0, 2\sqrt{41}\}, \{\sqrt{2}, 2\sqrt{41}\}, \{\sqrt{2}, 2\sqrt{42}\}, \{\sqrt{2}, 3\sqrt{19}\}, \{0, 3\sqrt{19}\},$$
$$\{2, 3\sqrt{19}\}, \{2, 4\sqrt{11}\}, \{2, \sqrt{179}\}, \{0, \sqrt{179}\}, \{\sqrt{2}, \sqrt{179}\}, \{\sqrt{2}, 6\sqrt{5}\},$$
$$\{\sqrt{2}, 2\sqrt{46}\}, \{0, \sqrt{187}\}, \{2, \sqrt{187}\}, \{\sqrt{2}, \sqrt{187}\}, \{0, \sqrt{195}\}, \{\sqrt{2}, \sqrt{195}\},$$
$$\{2, \sqrt{195}\}, \{\sqrt{2}, 14\}, \{2, 10\sqrt{2}\}, \{0, 10\sqrt{2}\}, \{2, \sqrt{203}\}, \{\sqrt{2}, \sqrt{203}\}, \{0, \sqrt{203}\},$$
$$\{2, 2\sqrt{51}\}, \{\sqrt{2}, \sqrt{211}\}, \{\sqrt{2}, 2\sqrt{53}\}, \{2, 2\sqrt{53}\}, \{0, 6\sqrt{6}\}, \{2, 6\sqrt{6}\},$$
$$\{0, \sqrt{219}\}, \{\sqrt{2}, \sqrt{219}\}, \{0, 4\sqrt{14}\}, \{\sqrt{2}, \sqrt{227}\}, \{0, \sqrt{227}\}, \{\sqrt{2}, 2\sqrt{57}\},$$
$$\{\sqrt{2}, 9\sqrt{3}\}, \{2, 9\sqrt{3}\}, \{0, 2\sqrt{62}\}, \{\sqrt{2}, 2\sqrt{62}\}, \{2, 2\sqrt{62}\}, \{0, \sqrt{251}\},$$
$$\{2, \sqrt{251}\}, \{\sqrt{2}, \sqrt{251}\}, \{\sqrt{2}, \sqrt{259}\}, \{0, \sqrt{259}\}, \{\sqrt{2}, 2\sqrt{65}\}, \{2, \sqrt{267}\},$$
$$\{2, 5\sqrt{11}\}, \{\sqrt{2}, 5\sqrt{11}\}, \{0, 5\sqrt{11}\}, \{\sqrt{2}, 2\sqrt{69}\}, \{0, 2\sqrt{73}\}, \{2, \sqrt{299}\},$$
$$\{\sqrt{2}, \sqrt{299}\}, \{2, 4\sqrt{19}\}, \{2, 2\sqrt{78}\}, \{\sqrt{2}, 3\sqrt{35}\}, \{\sqrt{2}, \sqrt{331}\}, \{2, \sqrt{347}\},$$
$$\{\sqrt{2}, 2\sqrt{89}\}, \{0, 11\sqrt{3}\}, \{0, \sqrt{371}\}, \{0, 2\sqrt{102}\}, \{\sqrt{2}, \sqrt{419}\}, \{2, 5\sqrt{19}\}\}$$

$$\mathbf{b} = \left\{\sqrt{3}\,,\ 2\sqrt{2}\,,\ \sqrt{11}\,,\ 4\right\}$$

$$\left\{\sqrt{3}\,,\ 2\sqrt{2}\,,\ \sqrt{11}\,,\ 4\right\}$$

$$\left\{\sqrt{3}\,,\ 2\sqrt{2}\,,\ \sqrt{11}\,,\ \sqrt{19}\,\right\}$$