In[433]:=
```
(*Instructor：Hiroyuki Akama
  Annex–1*)
Inverse[{{-4, 3}, {4, -4}}]
Inverse[{{-4, 3}, {4, -4}}].{{-4, 3}, {4, -4}}
% == IdentityMatrix[2]
```

Out[433]= $\left\{\left\{-1, -\frac{3}{4}\right\}, \{-1, -1\}\right\}$

Out[434]= {{1, 0}, {0, 1}}

Out[435]= True

In[436]:=
```
? Transpose
mat1 = {{-1, -3}, {-1, 3}};
Transpose[mat1]
mat2 = mat1.Transpose[mat1]
```

Transpose[*list*] transposes the first two levels in *list*.
Transpose[*list*, {n_1, n_2, …}] transposes *list* so that the kth level in *list* is the $n_k{}^{\text{th}}$ level in the result. ≫

Out[438]= {{-1, -1}, {-3, 3}}

Out[439]= {{10, -8}, {-8, 10}}

In[440]:=
```
eigen = Eigensystem[mat2]
eigenvals = eigen[[1]]
```

Out[440]= {{18, 2}, {{-1, 1}, {1, 1}}}

Out[441]= {18, 2}

In[442]:=
```
? SingularValueDecomposition
svd = SingularValueDecomposition[mat1]
svs = svd[[2]] // Diagonal
(*The 2 singular values of mat1 are extracted.*)
```

SingularValueDecomposition[*m*] gives the singular value decomposition for a numerical matrix *m*, as a list of matrices {*u*, *w*, *v*}, where *w* is a diagonal matrix, and *m* can be written as *u*.*w*.Conjugate[Transpose[*v*]].
SingularValueDecomposition[{*m*, *a*}] gives the generalized singular value decomposition of *m* with respect to *a*.
SingularValueDecomposition[*m*, *k*] gives the singular value decomposition associated with the *k* largest singular values of *m*.
SingularValueDecomposition[{*m*, *a*}, *k*] gives the generalized singular value decomposition associated with the *k* largest singular values. ≫

Out[443]= $\left\{\left\{\left\{-\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}\right\}, \left\{\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}\right\}\right\}, \left\{\left\{3\sqrt{2}, 0\right\}, \left\{0, \sqrt{2}\right\}\right\}, \{\{0, 1\}, \{1, 0\}\}\right\}$

Out[444]= $\left\{3\sqrt{2}, \sqrt{2}\right\}$

In[445]:=
```
svs^2 == eigenvals
```

Out[445]= True

In[446]:=
```
<< MultivariateStatistics`
```

In[447]:=
```
samplelist = Table[Table[RandomInteger[{-5, 5}], {i, 1, 3}], {i, 1, 3}]
```

Out[447]=
```
{{4, -3, 5}, {5, -1, -5}, {-4, 2, -5}}
```

In[448]:=
```
svdresult = SingularValueDecomposition[N[samplelist]]
```

Out[448]=
```
{{{-0.722855, 0.0689195, 0.687554},
  {0.0799299, 0.996674, -0.0158716}, {0.686361, -0.0434833, 0.72596}},
 {{9.73901, 0., 0.}, {0., 7.12256, 0.}, {0., 0., 0.648727}}, {{-0.537756, 0.762785, -0.359133},
  {0.355412, -0.181171, -0.916984}, {-0.764526, -0.620754, -0.173677}}}
```

In[449]:=
```
leftsvselected = {{-0.42881, 0.43077}, {-0.728998, 0.354147}, {0.533558, 0.830071}};

svdiagonal = {{8.76101, 0.}, {0., 5.50594}};

rightsvselected = {{-0.833125, 0.466596, -0.296969}, {-0.183563, 0.273231, 0.944272}};
```

In[452]:=
```
samplelisthut = leftsvselected.svdiagonal.rightsvselected
```

Out[452]=
```
{{2.69452, -1.10486, 3.35527}, {4.96304, -2.44726, 3.73792}, {-4.73339, 3.42986, 2.92744}}
```

In[453]:=
```
Correlation[samplelist] // N
```

Out[453]=
```
{{1., -0.87266, 0.409644}, {-0.87266, 1., -0.802955}, {0.409644, -0.802955, 1.}}
```

In[454]:=
```
Correlation[samplelisthut] // N
```

Out[454]=
```
{{1., -0.999983, 0.964864}, {-0.999983, 1., -0.963313}, {0.964864, -0.963313, 1.}}
```