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## K\_j

```
In[1]:= K = {{v0v0, v0v1, v0v2, v0v3},
             {v1v0, v1v1, v1v2, v1v3},
             {v2v0, v2v1, v2v2, v2v3},
             {v3v0, v3v1, v3v2, v3v3}};
MatrixForm[K]
```

```
Out[2]//MatrixForm=

$$\begin{pmatrix} v0v0 & v0v1 & v0v2 & v0v3 \\ v1v0 & v1v1 & v1v2 & v1v3 \\ v2v0 & v2v1 & v2v2 & v2v3 \\ v3v0 & v3v1 & v3v2 & v3v3 \end{pmatrix}$$

```

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## K\_vivj

```
In[3]:= v0v0 =
Table[Symbol["v0" <> ToString[i] <> "v0" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
MatrixForm[
v0v0]
```

```
Out[4]//MatrixForm=

$$\begin{pmatrix} v0xv0x & v0xv0y & v0xv0z \\ v0yv0x & v0yv0y & v0yv0z \\ v0zv0x & v0zv0y & v0zv0z \end{pmatrix}$$

```

```
In[5]:= v0v1 =
Table[Symbol["v0" <> ToString[i] <> "v1" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
MatrixForm[
v0v1]
```

```
Out[6]//MatrixForm=

$$\begin{pmatrix} v0xv1x & v0xv1y & v0xv1z \\ v0yv1x & v0yv1y & v0yv1z \\ v0zv1x & v0zv1y & v0zv1z \end{pmatrix}$$

```

```
In[7]:= v0v2 =
Table[Symbol["v0" <> ToString[i] <> "v2" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
MatrixForm[
v0v2]
```

```
Out[8]//MatrixForm=

$$\begin{pmatrix} v0xv2x & v0xv2y & v0xv2z \\ v0yv2x & v0yv2y & v0yv2z \\ v0zv2x & v0zv2y & v0zv2z \end{pmatrix}$$

```

```
In[9]:= v0v3 =
      Table[Symbol["v0" <> ToString[i] <> "v3" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
      MatrixForm[
        v0v3]
```

Out[10]//MatrixForm=

$$\begin{pmatrix} v0xv3x & v0xv3y & v0xv3z \\ v0yv3x & v0yv3y & v0yv3z \\ v0zv3x & v0zv3y & v0zv3z \end{pmatrix}$$

```
In[11]:= v1v0 =
      Table[Symbol["v1" <> ToString[i] <> "v0" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
      MatrixForm[
        v1v0]
```

Out[12]//MatrixForm=

$$\begin{pmatrix} v1xv0x & v1xv0y & v1xv0z \\ v1yv0x & v1yv0y & v1yv0z \\ v1zv0x & v1zv0y & v1zv0z \end{pmatrix}$$

```
In[13]:= v1v1 =
      Table[Symbol["v1" <> ToString[i] <> "v1" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
      MatrixForm[
        v1v1]
```

Out[14]//MatrixForm=

$$\begin{pmatrix} v1xv1x & v1xv1y & v1xv1z \\ v1yv1x & v1yv1y & v1yv1z \\ v1zv1x & v1zv1y & v1zv1z \end{pmatrix}$$

```
In[15]:= v1v2 =
      Table[Symbol["v1" <> ToString[i] <> "v2" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
      MatrixForm[
        v1v2]
```

Out[16]//MatrixForm=

$$\begin{pmatrix} v1xv2x & v1xv2y & v1xv2z \\ v1yv2x & v1yv2y & v1yv2z \\ v1zv2x & v1zv2y & v1zv2z \end{pmatrix}$$

```
In[17]:= v1v3 =
      Table[Symbol["v1" <> ToString[i] <> "v3" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
      MatrixForm[
        v1v3]
```

Out[18]//MatrixForm=

$$\begin{pmatrix} v1xv3x & v1xv3y & v1xv3z \\ v1yv3x & v1yv3y & v1yv3z \\ v1zv3x & v1zv3y & v1zv3z \end{pmatrix}$$

```
In[19]:= v2v0 =
      Table[Symbol["v2" <> ToString[i] <> "v0" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
      MatrixForm[
        v2v0]
```

```
Out[20]//MatrixForm=
      ( v2xv0x  v2xv0y  v2xv0z )
      ( v2yv0x  v2yv0y  v2yv0z )
      ( v2zv0x  v2zv0y  v2zv0z )
```

```
In[21]:= v2v1 =
      Table[Symbol["v2" <> ToString[i] <> "v1" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
      MatrixForm[
        v2v1]
```

```
Out[22]//MatrixForm=
      ( v2xv1x  v2xv1y  v2xv1z )
      ( v2yv1x  v2yv1y  v2yv1z )
      ( v2zv1x  v2zv1y  v2zv1z )
```

```
In[23]:= v2v2 =
      Table[Symbol["v2" <> ToString[i] <> "v2" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
      MatrixForm[
        v2v2]
```

```
Out[24]//MatrixForm=
      ( v2xv2x  v2xv2y  v2xv2z )
      ( v2yv2x  v2yv2y  v2yv2z )
      ( v2zv2x  v2zv2y  v2zv2z )
```

```
In[25]:= v2v3 =
      Table[Symbol["v2" <> ToString[i] <> "v3" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
      MatrixForm[
        v2v3]
```

```
Out[26]//MatrixForm=
      ( v2xv3x  v2xv3y  v2xv3z )
      ( v2yv3x  v2yv3y  v2yv3z )
      ( v2zv3x  v2zv3y  v2zv3z )
```

```
In[27]:= v3v0 =
      Table[Symbol["v3" <> ToString[i] <> "v0" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
      MatrixForm[
        v3v0]
```

```
Out[28]//MatrixForm=
      ( v3xv0x  v3xv0y  v3xv0z )
      ( v3yv0x  v3yv0y  v3yv0z )
      ( v3zv0x  v3zv0y  v3zv0z )
```

```
In[29]:= v3v1 =
  Table[Symbol["v3" <> ToString[i] <> "v1" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
  MatrixForm[
    v3v1]
```

Out[30]//MatrixForm=

$$\begin{pmatrix} v3xv1x & v3xv1y & v3xv1z \\ v3yv1x & v3yv1y & v3yv1z \\ v3zv1x & v3zv1y & v3zv1z \end{pmatrix}$$

```
In[31]:= v3v2 =
  Table[Symbol["v3" <> ToString[i] <> "v2" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
  MatrixForm[
    v3v2]
```

Out[32]//MatrixForm=

$$\begin{pmatrix} v3xv2x & v3xv2y & v3xv2z \\ v3yv2x & v3yv2y & v3yv2z \\ v3zv2x & v3zv2y & v3zv2z \end{pmatrix}$$

```
In[33]:= v3v3 =
  Table[Symbol["v3" <> ToString[i] <> "v3" <> ToString[j]], {i, {x, y, z}}, {j, {x, y, z}}];
  MatrixForm[
    v3v3]
```

Out[34]//MatrixForm=

$$\begin{pmatrix} v3xv3x & v3xv3y & v3xv3z \\ v3yv3x & v3yv3y & v3yv3z \\ v3zv3x & v3zv3y & v3zv3z \end{pmatrix}$$

## final Kj

```
In[35]:= k0 = Join[v0v0, v0v1, v0v2, v0v3, 2];
k1 = Join[v1v0, v1v1, v1v2, v1v3, 2];
k2 = Join[v2v0, v2v1, v2v2, v2v3, 2];
k3 = Join[v3v0, v3v1, v3v2, v3v3, 2];
MatrixForm[Join[k0, k1, k2, k3]]
```

Out[39]//MatrixForm=

v0xv0x	v0xv0y	v0xv0z	v0xv1x	v0xv1y	v0xv1z	v0xv2x	v0xv2y	v0xv2z	v0xv3x	v0xv3y	v0x
v0yv0x	v0yv0y	v0yv0z	v0yv1x	v0yv1y	v0yv1z	v0yv2x	v0yv2y	v0yv2z	v0yv3x	v0yv3y	v0y
v0zv0x	v0zv0y	v0zv0z	v0zv1x	v0zv1y	v0zv1z	v0zv2x	v0zv2y	v0zv2z	v0zv3x	v0zv3y	v0z
v1xv0x	v1xv0y	v1xv0z	v1xv1x	v1xv1y	v1xv1z	v1xv2x	v1xv2y	v1xv2z	v1xv3x	v1xv3y	v1x
v1yv0x	v1yv0y	v1yv0z	v1yv1x	v1yv1y	v1yv1z	v1yv2x	v1yv2y	v1yv2z	v1yv3x	v1yv3y	v1y
v1zv0x	v1zv0y	v1zv0z	v1zv1x	v1zv1y	v1zv1z	v1zv2x	v1zv2y	v1zv2z	v1zv3x	v1zv3y	v1z
v2xv0x	v2xv0y	v2xv0z	v2xv1x	v2xv1y	v2xv1z	v2xv2x	v2xv2y	v2xv2z	v2xv3x	v2xv3y	v2x
v2yv0x	v2yv0y	v2yv0z	v2yv1x	v2yv1y	v2yv1z	v2yv2x	v2yv2y	v2yv2z	v2yv3x	v2yv3y	v2y
v2zv0x	v2zv0y	v2zv0z	v2zv1x	v2zv1y	v2zv1z	v2zv2x	v2zv2y	v2zv2z	v2zv3x	v2zv3y	v2z
v3xv0x	v3xv0y	v3xv0z	v3xv1x	v3xv1y	v3xv1z	v3xv2x	v3xv2y	v3xv2z	v3xv3x	v3xv3y	v3x
v3yv0x	v3yv0y	v3yv0z	v3yv1x	v3yv1y	v3yv1z	v3yv2x	v3yv2y	v3yv2z	v3yv3x	v3yv3y	v3y
v3zv0x	v3zv0y	v3zv0z	v3zv1x	v3zv1y	v3zv1z	v3zv2x	v3zv2y	v3zv2z	v3zv3x	v3zv3y	v3z