This is how we enter a matrix in Mathematica:

```
In[•]:= {{1, -1, 1, -1}, {0, 2, -8, 18}, {0, 0, 8, -48},
         {0, 0, 0, 32}}
```

```
Out[•]= {{1, -1, 1, -1}, {0, 2, -8, 18}, {0, 0, 8, -48}, {0, 0, 0, 32}}
```

Now find its inverse:

```
In[•]:= Inverse[{{1, -1, 1, -1}, {0, 2, -8, 18}, {0, 0, 8, -48},
           {0, 0, 0, 32}}]
```

$$\text{Out[•]=}\ \left\{\left\{1, \frac{1}{2}, \frac{3}{8}, \frac{5}{16}\right\}, \left\{0, \frac{1}{2}, \frac{1}{2}, \frac{15}{32}\right\}, \left\{0, 0, \frac{1}{8}, \frac{3}{16}\right\}, \left\{0, 0, 0, \frac{1}{32}\right\}\right\}$$

Since I use LaTeX, this is how I export a matrix as LaTeX code.

```
In[2]:= TeXForm[{{1, 1/2, 3/8, 5/16}, {0, 1/2, 1/2, 15/32}, {0, 0, 1/8, 3/16},
          {0, 0, 0, 1/32}}]
```

Out[2]//TeXForm=

```
\left(
\begin{array}{cccc}
 1 & \frac{1}{2} & \frac{3}{8}
   & \frac{5}{16} \\
 0 & \frac{1}{2} & \frac{1}{2}
   & \frac{15}{32} \\
 0 & 0 & \frac{1}{8} &
   \frac{3}{16} \\
 0 & 0 & 0 & \frac{1}{32} \\
\end{array}
\right)
```

Now verify whether the inverse is correct:

In[•]:=
$$\left\{\left\{1, \frac{1}{2}, \frac{3}{8}, \frac{5}{16}\right\}, \left\{0, \frac{1}{2}, \frac{1}{2}, \frac{15}{32}\right\}, \left\{0, 0, \frac{1}{8}, \frac{3}{16}\right\}, \left\{0, 0, 0, \frac{1}{32}\right\}\right\}.\{\{1, -1, 1, -1\}, \{0, 2, -8, 18\}, \{0, 0, 8, -48\}, \{0, 0, 0, 32\}\}$$

Out[•]=
$$\{\{1, 0, 0, 0\}, \{0, 1, 0, 0\}, \{0, 0, 1, 0\}, \{0, 0, 0, 1\}\}$$

Now show the inverse in traditional matrix notation:

In[•]:=
$$\text{MatrixForm}\left[\left\{\left\{1, \frac{1}{2}, \frac{3}{8}, \frac{5}{16}\right\}, \left\{0, \frac{1}{2}, \frac{1}{2}, \frac{15}{32}\right\}, \left\{0, 0, \frac{1}{8}, \frac{3}{16}\right\}, \left\{0, 0, 0, \frac{1}{32}\right\}\right\}\right]$$

Out[•]//MatrixForm=
$$\begin{pmatrix} 1 & \frac{1}{2} & \frac{3}{8} & \frac{5}{16} \\ 0 & \frac{1}{2} & \frac{1}{2} & \frac{15}{32} \\ 0 & 0 & \frac{1}{8} & \frac{3}{16} \\ 0 & 0 & 0 & \frac{1}{32} \end{pmatrix}$$

Now find the transpose of this matrix. I need the last row of the transpose

In[•]:=
$$\text{Transpose}\left[\left\{\left\{1, \frac{1}{2}, \frac{3}{8}, \frac{5}{16}\right\}, \left\{0, \frac{1}{2}, \frac{1}{2}, \frac{15}{32}\right\}, \left\{0, 0, \frac{1}{8}, \frac{3}{16}\right\}, \left\{0, 0, 0, \frac{1}{32}\right\}\right\}\right]$$

Out[•]=
$$\left\{\{1, 0, 0, 0\}, \left\{\frac{1}{2}, \frac{1}{2}, 0, 0\right\}, \left\{\frac{3}{8}, \frac{1}{2}, \frac{1}{8}, 0\right\}, \left\{\frac{5}{16}, \frac{15}{32}, \frac{3}{16}, \frac{1}{32}\right\}\right\}$$

Now create a linear combination of the multiple angle trig functions

with the given coefficients

In[4]:=
$$\left\{\frac{5}{16}, \frac{15}{32}, \frac{3}{16}, \frac{1}{32}\right\}.\{1, \text{Cos}[2\,t], \text{Cos}[4\,t], \text{Cos}[6\,t]\}$$

Out[4]=
$$\frac{5}{16} + \frac{15}{32}\,\text{Cos}[2\,t] + \frac{3}{16}\,\text{Cos}[4\,t] + \frac{1}{32}\,\text{Cos}[6\,t]$$

I want to copy this to the website as LaTeX code

In[3]:=
$$\text{TeXForm}\left[\frac{5}{16} + \frac{15}{32}\,\text{Cos}[2\,t] + \frac{3}{16}\,\text{Cos}[4\,t] + \frac{1}{32}\,\text{Cos}[6\,t]\right]$$

Out[3]//TeXForm=

```
\frac{15}{32} \cos (2 t)+\frac{3}{16} \cos (4
   t)+\frac{1}{32} \cos (6 t)+\frac{5}{16}
```

On the website I explained why the following identity is true:

In[5]:=
$$\text{FullSimplify}\left[\frac{5}{16} + \frac{15}{32}\,\text{Cos}[2\,t] + \frac{3}{16}\,\text{Cos}[4\,t] + \frac{1}{32}\,\text{Cos}[6\,t]\right]$$

Out[5]=
$$\text{Cos}[t]^6$$