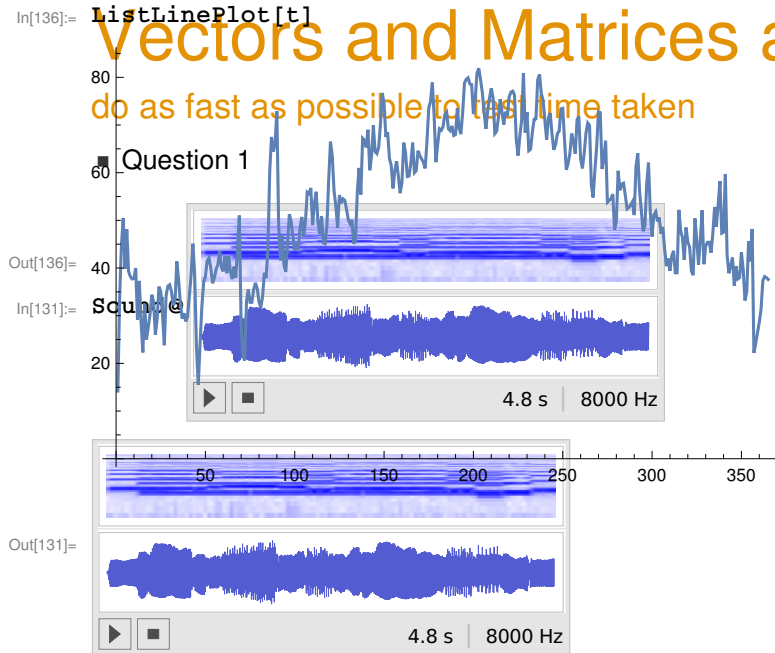


Vectors and Matrices as Data

do as fast as possible to test time taken

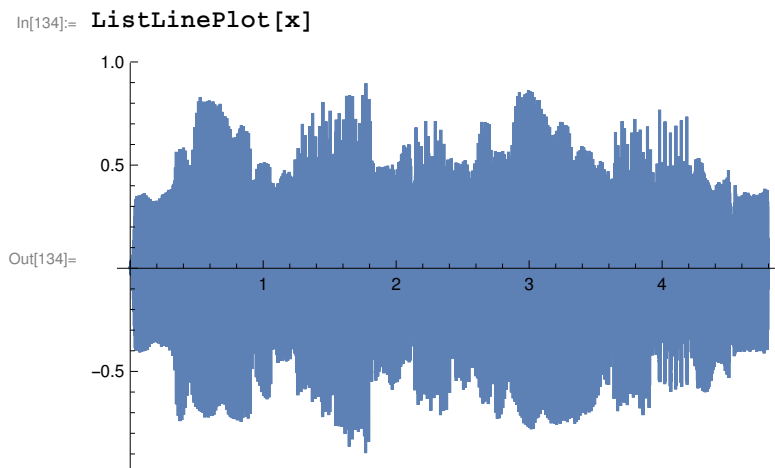


```
x = Import["/home/nathan/QEA-Homework/module 2/day4/hornCSV.csv"];
x1 = Import[
  "/home/nathan/QEA-Homework/module 2/day4/english_horn.wav", "Data"] // Flatten
```

Out[133]=

```
{0.00466919, 0.010376, 0.00534058, 0.00265503, 0.0039978, 0.00146484,
 -0.00146484, -0.00311279, ... 38384 ..., -0.00665283, -0.00582886, -0.010498,
 -0.00796509, -0.00369263, -0.000457764, 0.000671387, 0.000396729}
```

large output show less show more show all set size limit...



```
t = Transpose@
  Import["/home/nathan/QEA-Homework/module 2/day4/1998DailyTempBos.csv"];

```

Question 2

In[136]:= **risum** = Sum[t[t],

In[141]:=

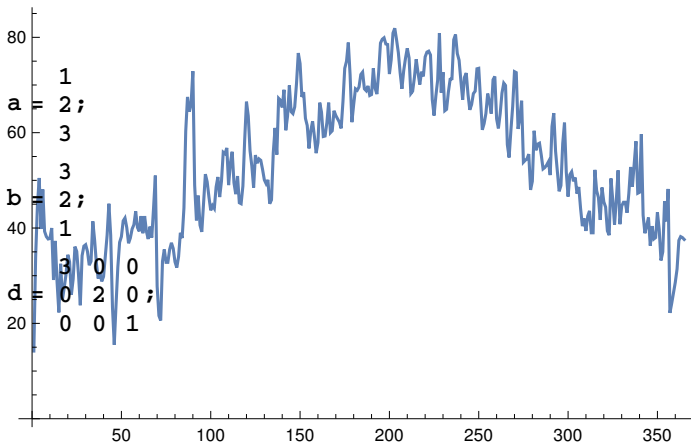
In[142]:= **a** = 2;
3

b = 2;
1

d = 0 0 0;
0 0 1

c = 3 0 0;
0 2 0;
0 0 1

Out[136]=



In[137]:= **2. Transpose[x1][[1]]**

Transpose::nmtx : The first two levels of

{0.00466919, 0.010376, 0.00534058, 0.00265503, 0.0039978, 0.00146484, -0.00146484, -0.00311279, -0.00344849, <<33>>, 0.0155029, 0.0135193, 0.0136414, 0.0169067, 0.0230713, 0.0341797, 0.0192261, 0.025116, <<38350>>} cannot be transposed. >>

Out[137]=

```
{0.00933838, 0.020752, 0.0106812, 0.00531006, 0.00799561, 0.00292969,
-0.00292969, -0.00622559, -0.00689697, ... 38 383 ..., -0.0133057, -0.0116577,
-0.0209961, -0.0159302, -0.00738525, -0.000915527, 0.00134277, 0.000793457}
```

large output

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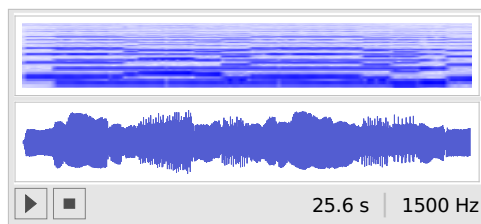
show more

show all

set size limit...

In[138]:= **audio** = Sound[SampledSoundList[x1, 1500]]

Out[138]=



In[139]:= **Export**["low.flac", audio]

Out[139]= low.flac

```
in = Import[
  "/home/nathan/QEA-Homework/module 2/day4/english_horn.wav", "Data"] // Flatten
```

Out[140]=

```
{0.00466919, 0.010376, 0.00534058, 0.00265503, 0.0039978, 0.00146484,
-0.00146484, -0.00311279, ... 38 384 ..., -0.00665283, -0.00582886, -0.010498,
-0.00796509, -0.00369263, -0.000457764, 0.000671387, 0.000396729}
```

large output

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set size limit...

■ Question 2

In[141]:=

```

      1
In[142]:= a = 2;
      3
      3
      b = 2;
      1
      3 0 0
      d = 0 2 0;
      0 0 1

```

In[145]:= **b * a**

Out[145]= {{3}, {4}, {3}}

In[146]:= **a.b**

Dot::dotsh : Tensors {{1}, {2}, {3}} and {{3}, {2}, {1}} have incompatible shapes. >>

Out[146]= {{1}, {2}, {3}}.{{3}, {2}, {1}}

In[147]:= **a.Transpose[b]**

Out[147]= {{3, 2, 1}, {6, 4, 2}, {9, 6, 3}}

In[148]:= **d.a**

Out[148]= {{3}, {4}, {3}}

In[149]:= **d.a.Transpose[a]**

Out[149]= {{3, 6, 9}, {4, 8, 12}, {3, 6, 9}}

■ Question 3, 4

In[150]:= **Clear["Global`*"]**

```

In[151]:= d = Join[
  {Join[{1}, Table[0, 364]]},
  Table[Join[Table[0, i - 1], {1/3, 1/3, 1/3}, Table[0, 363 - i]], {i, 363}],
  {Join[Table[0, 364], {1}]}
]

```

Out[151]=

{ ... 1 ... }

large output

[show less](#)

[show more](#)

[show all](#)

[set size limit...](#)

```
t = Import["/home/nathan/QEA-Homework/module 2/day4/1998DailyTempBos.csv"];
```

In[153]:= **Dimensions[t]**

Dimensions[d]

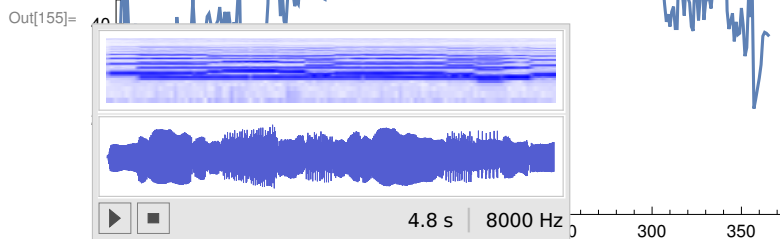
Out[153]= {365, 1}

Out[154]= {365, 365}

```

In[155]:= Clear[NEPba,Transpose[t]]
SoundData=Import[Transpose[d.t]]
ListLinePlot[Transpose[Developer`ToShortest[Module[2]]Day4/english_horn.wav", "Data"] // Flatten
Sound[SampledSoundList[soundData, 8000]]
80
1 / 3
d = 1 / 3
1 / 3
60
SoundDatad = ListConvolve[d^T[[1]], soundData]
Sound[SampledSoundList[soundDatad, 8000]]

```

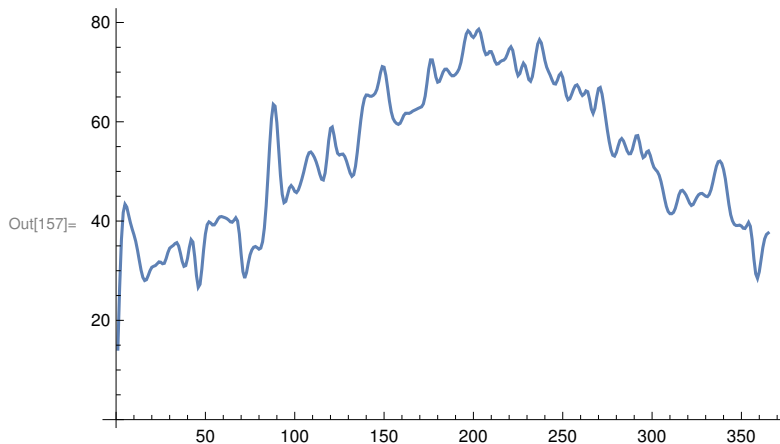
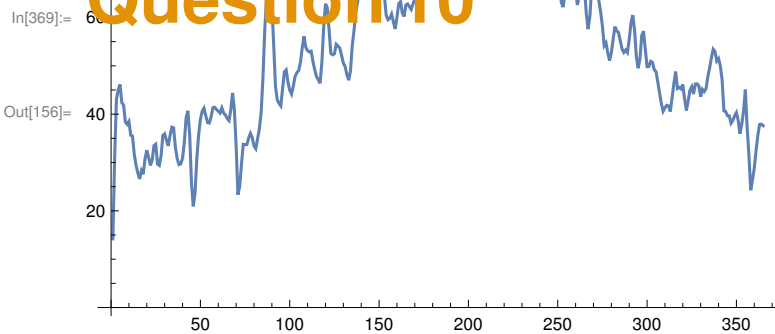


```

ListLinePlot[{soundData, soundDatad}]

```

Question 10

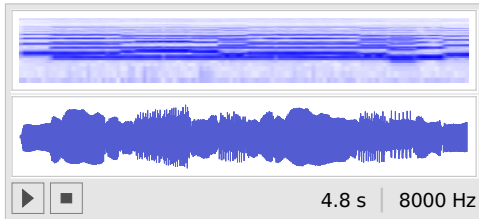


■ Question 7, 8

```

Clear["Global`*"]
soundData = Import[
  "/home/nathan/QEA-Homework/module 2/day4/english_horn.wav", "Data"] // Flatten
Sound[SampledSoundList[soundData, 8000]]
1 / 3
d = 1 / 3
1 / 3
soundDatad = ListConvolve[d^T[[1]], soundData]
Sound[SampledSoundList[soundDatad, 8000]]

```



```
ListLinePlot[{soundData, soundDatad}]
```

Question 10

In[369]:=

Out[654]= {0.00540771, 0.00476685, 0.00239868, 0.000708008, -0.000512695, -0.00227051, -0.00422363, ... 38 382 ..., -0.0150452, -0.0136292, -0.0103455, -0.00692749, -0.00568848, -0.00438843, -0.00220947}

large output

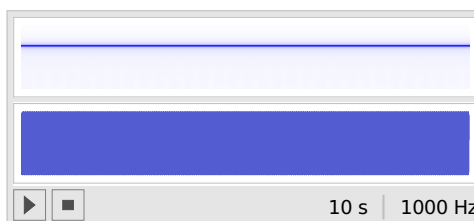
show less

show more

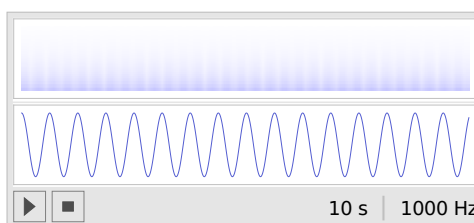
show all

set size limit...

Out[659]= High Frequency + High Pass =



Out[660]= Low Frequency + High Pass =



In[651]:=

```

Clear["Global`*"]
soundData = Import[
  "/home/nathan/QEA-Homework/module 2/day4/english_horn.wav", "Data"] // Flatten
h2 = {1/5, 1/5, 1/5, 1/5, 1/5}
soundData = ListConvolve[h2, soundData]
xhf2 = Table[Cos[1000 t], {t, 0, 10, 10./10000}];
xlf2 = Table[Cos[10 t], {t, 0, 10, 10./10000}];
hfSound2 = ListConvolve[h2, xhf2];
lfSound2 = ListConvolve[h2, xlf2];
"High Frequency + High Pass = " Sound[SampledSoundList[hfSound2, 1000]]
"Low Frequency + High Pass = " Sound[SampledSoundList[lfSound2, 1000]]

```

Out[661]=

Question 12

```

ListPlot[{hfSound2, lfSound2}, PlotRange -> {{0, 100}, {-1, 1}}]

```

Out[652]= {0.00466919, 0.010376, 0.00534058, 0.00265503, 0.0039978, 0.00146484, -0.00146484, -0.00311279, ... 38 384 ..., -0.00665283, -0.00582886, -0.010498, -0.00796509, -0.00369263, -0.000457764, 0.000671387, 0.000396729}

large output

show less

show more

show all

set size limit...

Out[653]= $\left\{\frac{1}{5}, \frac{1}{5}, \frac{1}{5}, \frac{1}{5}, \frac{1}{5}\right\}$

```
t = Import["/home/nathan/QEA-Homework/module 2/day4/1998DailyTempBos.csv"];
```

```
In[469]:= h = Table[1 / 5, 5]
```

```
Out[469]= {1/5, 1/5, 1/5, 1/5, 1/5}
```

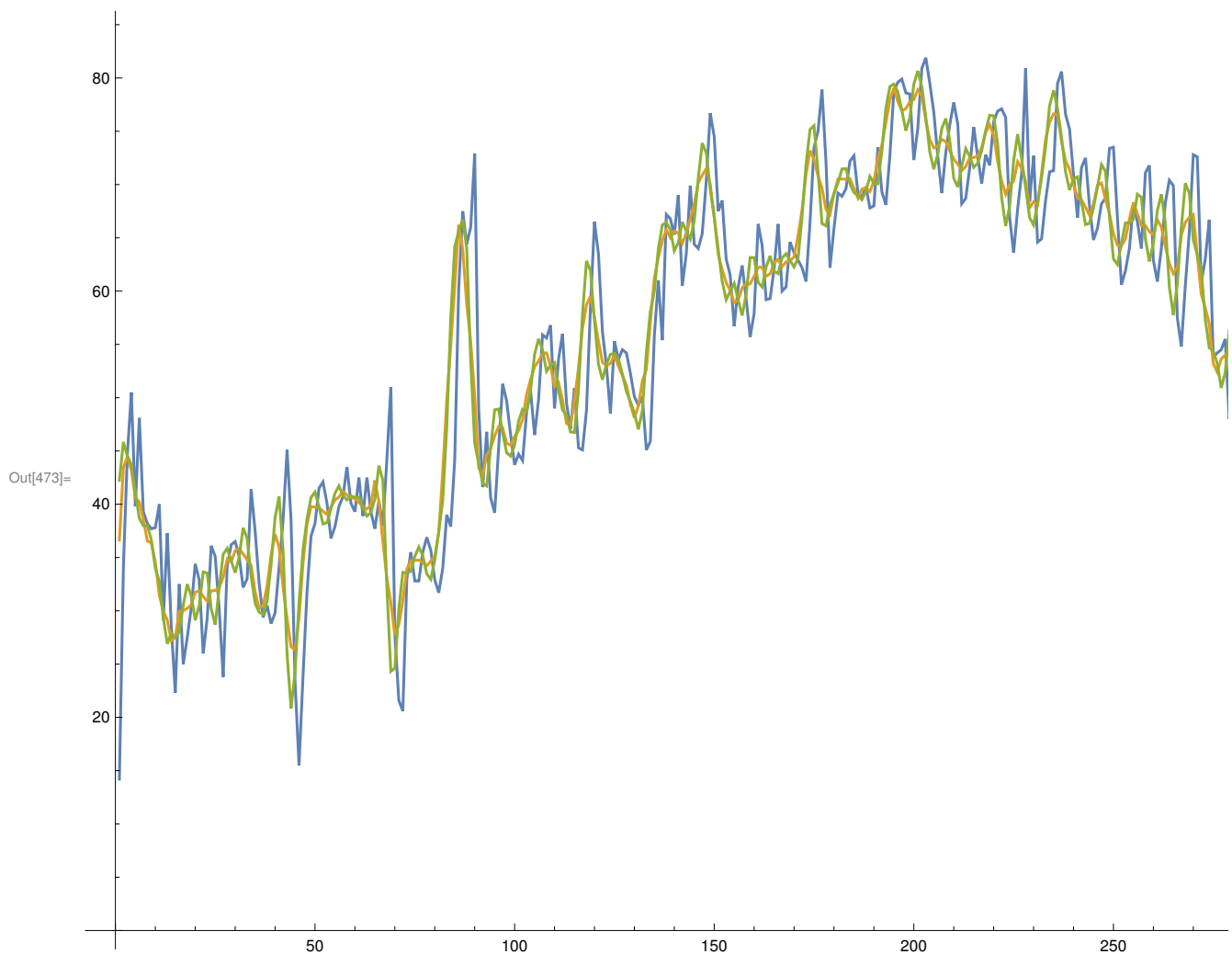
```
In[470]:= t1 = ListConvolve[h, t^r[[1]]];
```

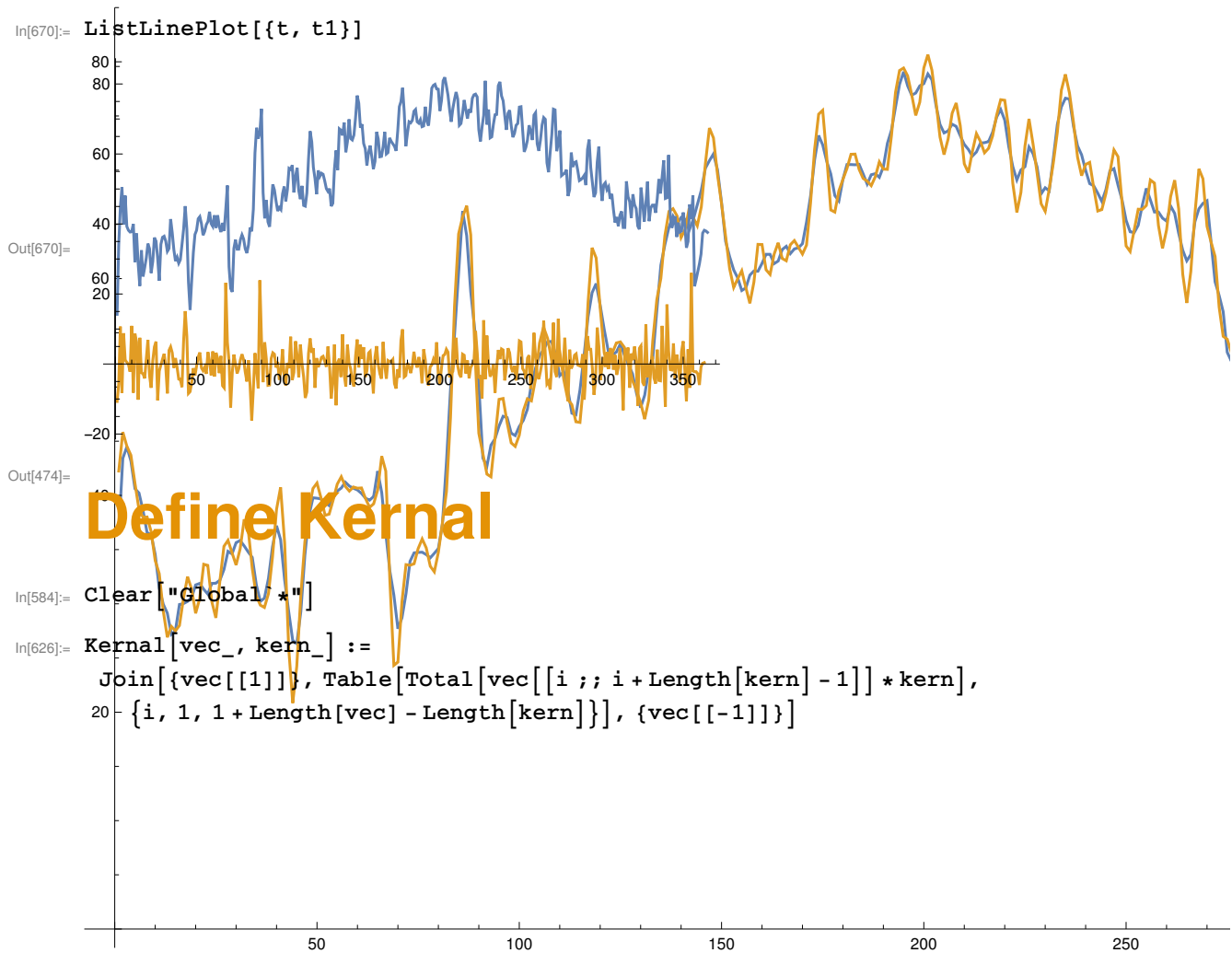
```
In[471]:= k = {.036, .241, .446, .241, .036}
```

```
Out[471]= {0.036, 0.241, 0.446, 0.241, 0.036}
```

```
In[472]:= t2 = ListConvolve[k, t^r[[1]]];
```

```
In[473]:= ListLinePlot[{t^r[[1]], t1, t2}]
ListLinePlot[{t1, t2}]
```





Question 14

In[475]:= `Clear["Global`*"]`

In[666]:= `t = Import["/home/nathan/QEA-Homework/module 2/day4/1998DailyTempBos.csv"];`
`h = {-1, 1, 0};`
`t = t[[1]];`

In[669]:= `t1 = ListConvolve[h, t];`