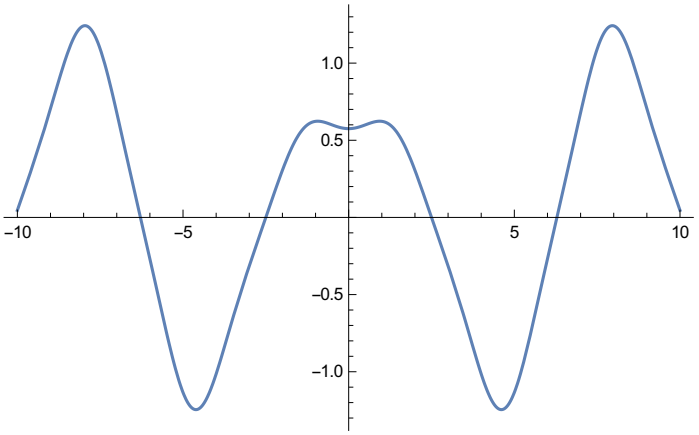
In[2]:=
```
DSolve[y''[x] + (a - 2 q Cos[2 x]) y[x] == 0, y, x]
```

Out[2]=
```
{{y → Function[{x}, C[1] MathieuC[a, q, x] + C[2] MathieuS[a, q, x]]}}
```

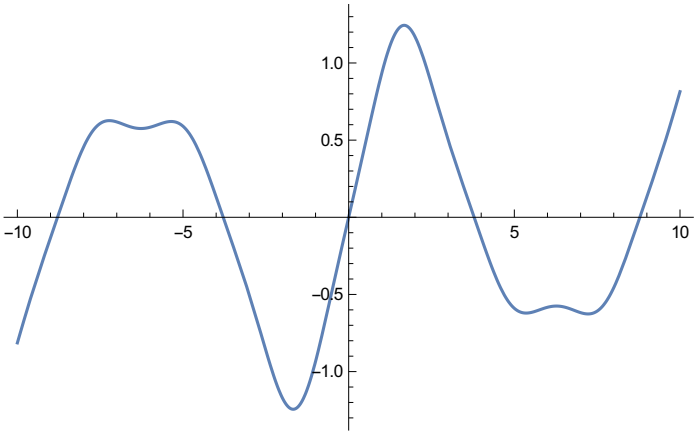
In[4]:=
```
Plot[MathieuC[a, q, x] /. {a → 0.4, q → 0.4}, {x, -10, 10}]
```

Out[4]=



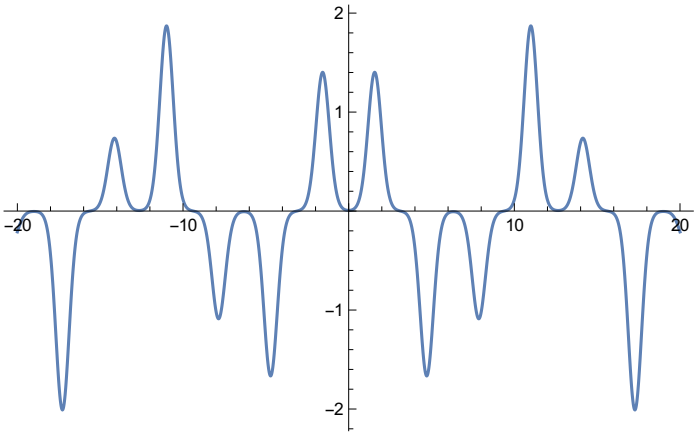

In[5]:=
```
Plot[MathieuS[a, q, x] /. {a → 0.4, q → 0.4}, {x, -10, 10}]
```

Out[5]=



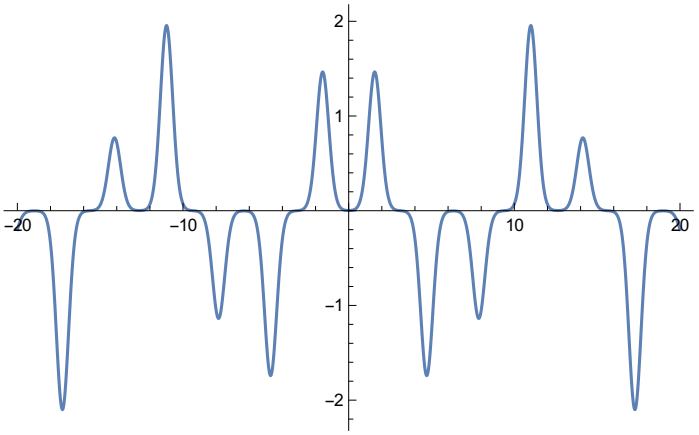

In[11]:=
```
Plot[MathieuC[MathieuCharacteristicA[0.53, q], q, x] /. {q → 10.2}, {x, -20, 20}]
```

Out[11]=



In[12]:=
```
Plot[MathieuC[MathieuCharacteristicB[0.53, q], q, x] /. {q → 14.2}, {x, -20, 20}]
```

Out[12]=



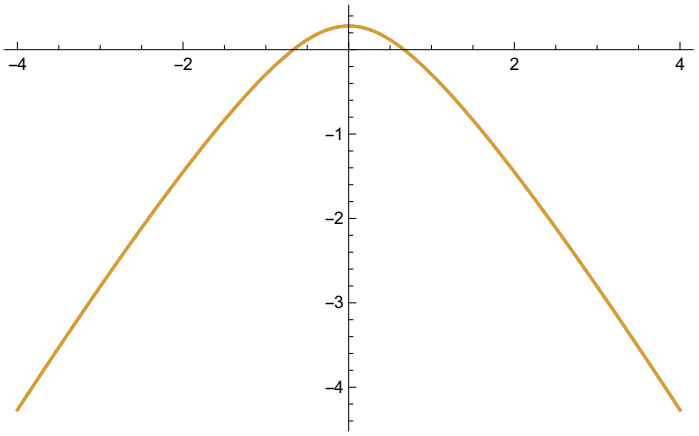

In[14]:=
```
MathieuCharacteristicB[0.53, q] /. {q → 1.0}
MathieuCharacteristicA[0.53, q] /. {q → 1.0}
```

Out[14]= -0.29137615

Out[15]= -0.29137615

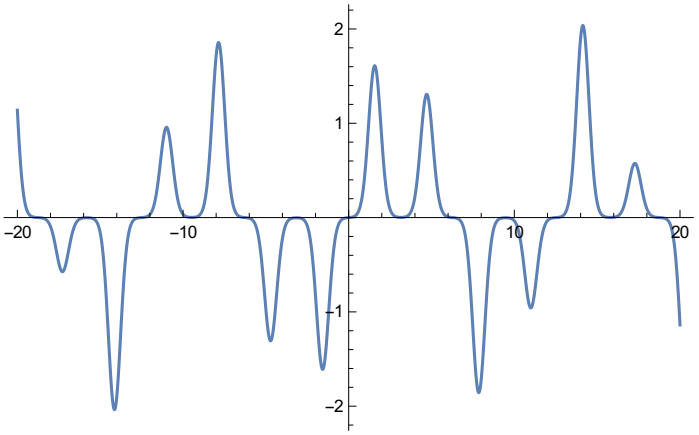
In[16]:=
```
Plot[{MathieuCharacteristicA[0.53, q],
  MathieuCharacteristicB[0.53, q]}, {q, -4, 4}]
```

Out[16]=



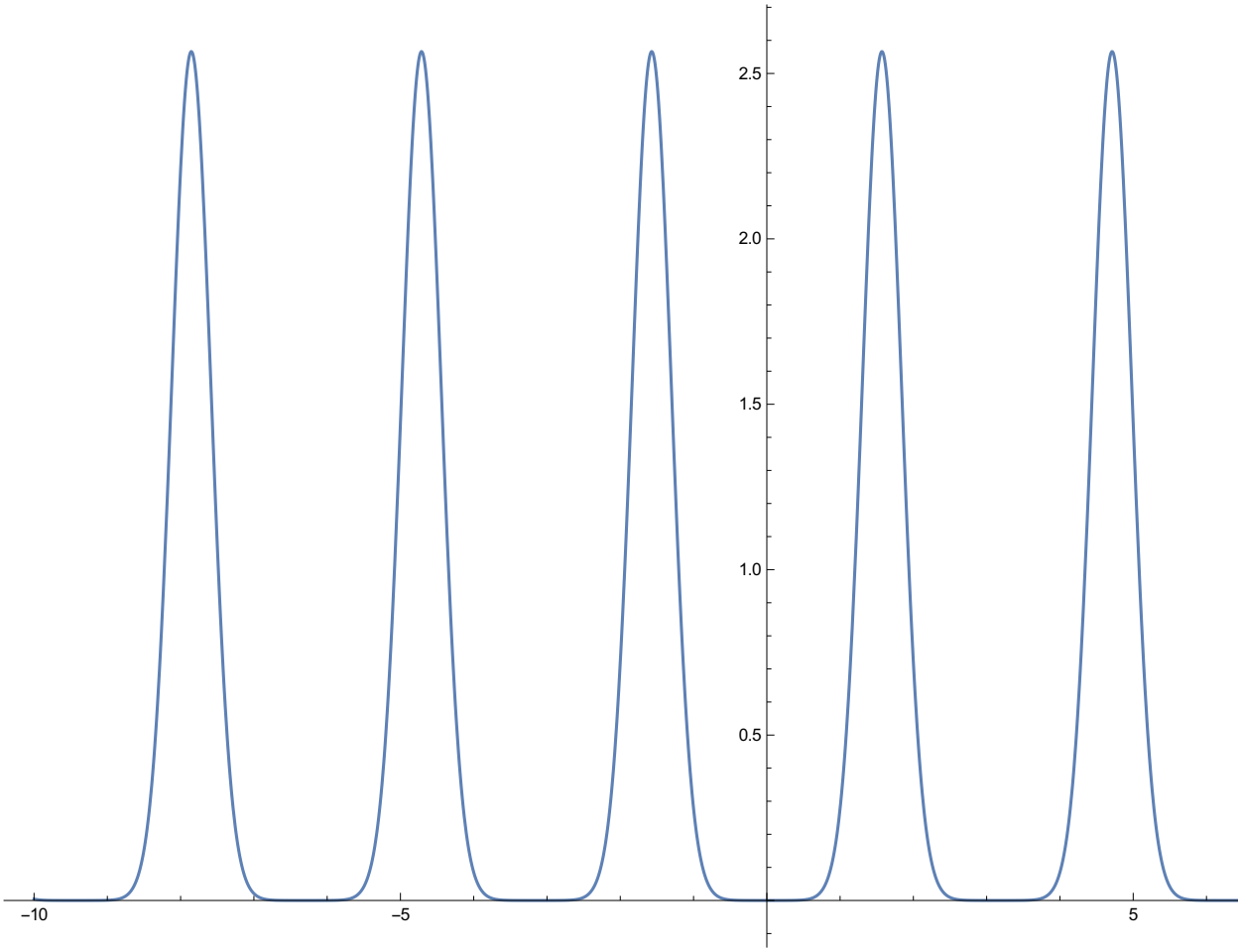
In[17]:=
```
Plot[MathieuS[MathieuCharacteristicB[0.53, q], q, x] /. {q → 14.2}, {x, -20, 20}]
```

Out[17]=



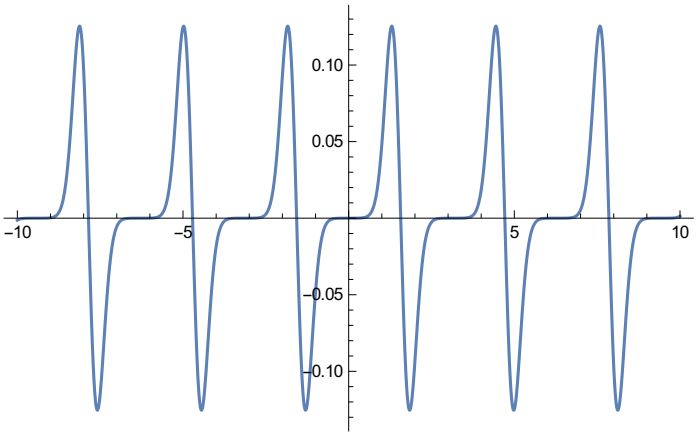

In[30]:=
```
Plot[Re[(MathieuC[MathieuCharacteristicA[k, q], q, x] +
      I MathieuS[MathieuCharacteristicA[k, q], q, x]) Exp[-I k x]] /.
  {k → 0.3, q → 50.3}, {x, -10, 10}, PlotRange → All]
```

Out[30]=



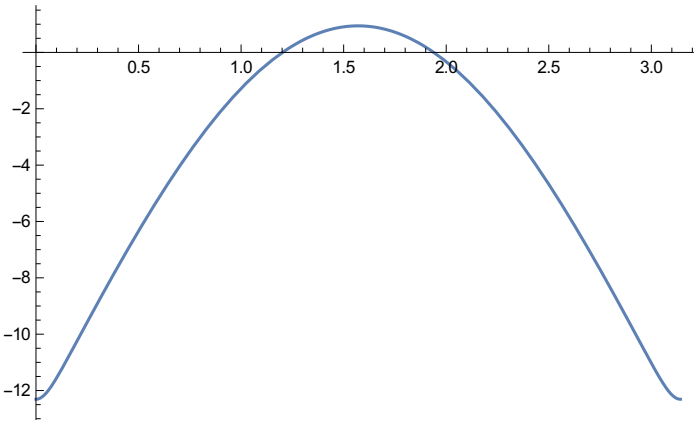
In[24]:=
```
Plot[Im[(MathieuC[MathieuCharacteristicA[k, q], q, x] +
      I MathieuS[MathieuCharacteristicA[k, q], q, x])
    Exp[-I k x]] /. {k → 0.3, q → 50.3}, {x, -10, 10}]
```

Out[24]=



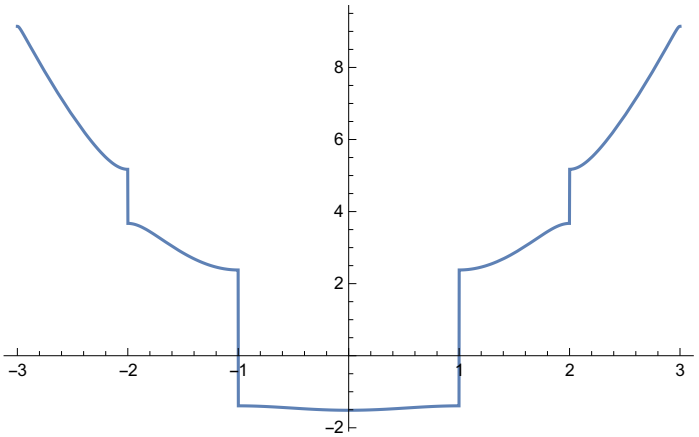

In[88]:=
```
Plot[Log[Re[(MathieuC[MathieuCharacteristicA[k, q], q, x] +
       I MathieuS[MathieuCharacteristicA[k, q], q, x]) Exp[-I k x]]] /.
  {k → 0.3, q → 50.3}, {x, 0, Pi}, PlotRange → All]
```

Out[88]=



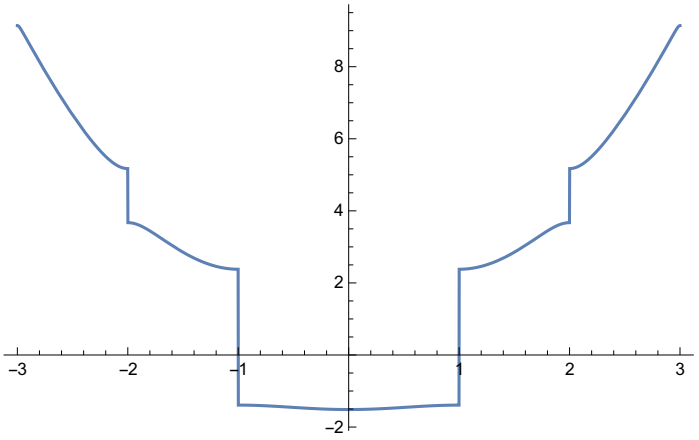

In[102]:=
```
Plot[MathieuCharacteristicB[k, 2], {k, -3, 3}]
```

Out[102]=



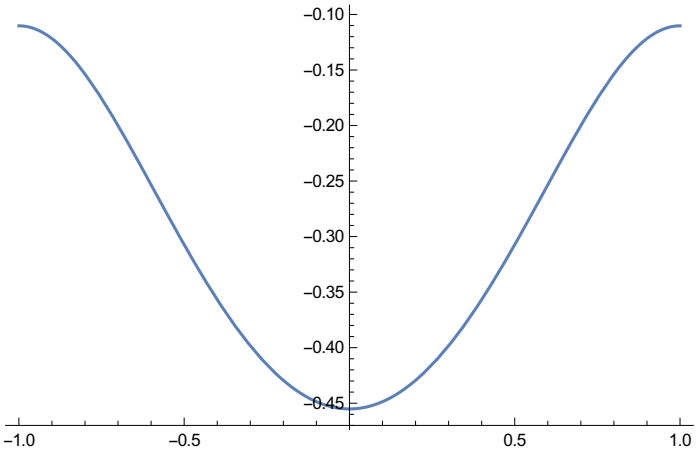
In[103]:=
```
Plot[MathieuCharacteristicA[k, 2], {k, -3, 3}]
```

Out[103]=



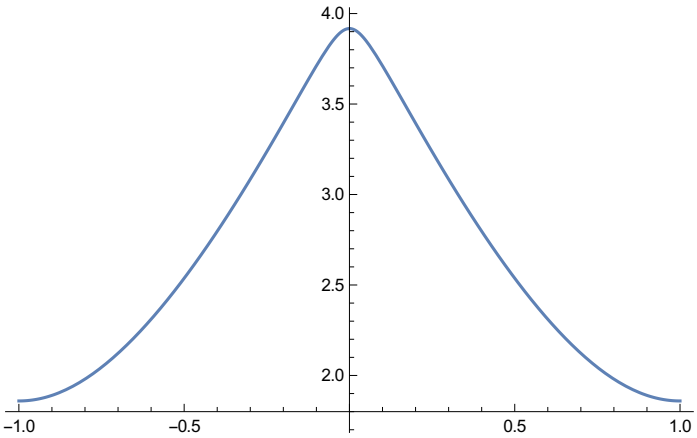

In[299]:=
```
q0 = Plot[MathieuCharacteristicA[k, 1], {k, -1, 1}]
```

Out[299]=

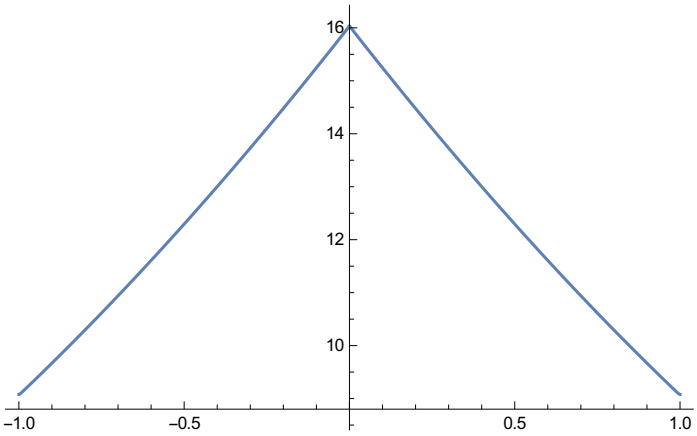


In[336]:=
```
q1 = Plot[MathieuCharacteristicA[k + 2, 1], {k, -1, 0}];
q2 = Plot[MathieuCharacteristicA[k - 2, 1], {k, 0, 1}];
q3 = Plot[MathieuCharacteristicA[k + 4, 1], {k, -1, 0}];
q4 = Plot[MathieuCharacteristicA[k - 4, 1], {k, 0, 1}];
q12 = Show[q1, q2, PlotRange → All]
q34 = Show[q3, q4, PlotRange → All]
```

Out[340]=

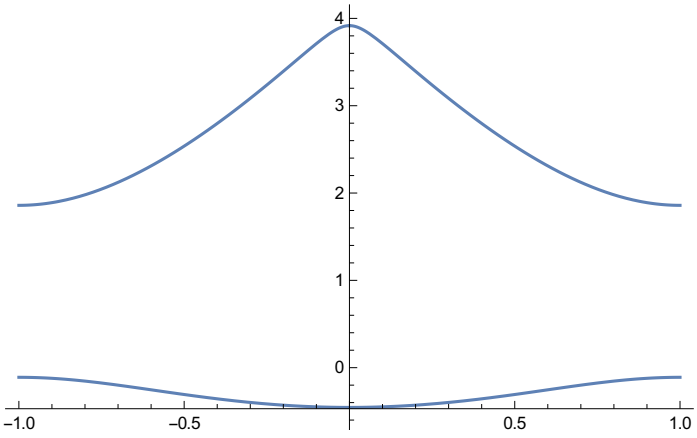



Out[341]=




In[342]:=
```
Show[q0, q12, PlotRange → All]
```

Out[342]=



In[144]:=
```
MathieuCharacteristicB[0.4, 0.4]
```

Out[144]=
```
0.067342773
```

In[145]:=
```
MathieuCharacteristicExponent[0.06734277257330788`, 0.4]
```

Out[145]=
```
0.4
```

In[146]:=
```
MathieuCharacteristicB[0.43234123, 2.123323134]
```

Out[146]=
```
-1.6254659
```

In[343]:=
```
MathieuCharacteristicExponent[-1.625465910293771, 2.123323134]
```

Out[343]=
```
0.43234123
```

In[347]:=
```
MathieuCharacteristicB[4.4, 0.4]
MathieuCharacteristicExponent[19.36435817288173, 0.4]
```

Out[347]=
```
19.364358
```

Out[348]=
```
4.4
```

In[351]:=
```
MathieuCharacteristicB[49.4, 0.4]
MathieuCharacteristicExponent[2440.3600327954873`, 0.4]
```

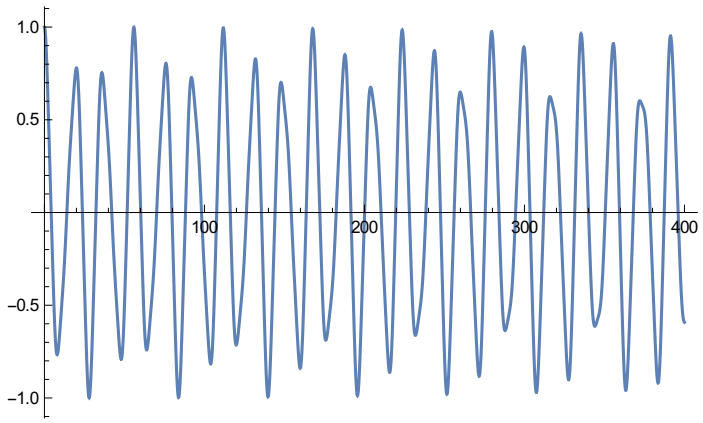
Out[351]=
```
2440.36
```

Out[352]=
```
49.4
```

In[227]:=
```
a = 0.1;
b = 0.1;
w = 0.9;
s =
 NDSolve[{y''[x] + y[x] (a + b Cos[w x]) == 0, y[0] == 1, y'[0] == 0}, y[x], {x, 0, 400}]
Plot[Evaluate[y[x] /. s], {x, 0, 400}, PlotRange → All]
```

Out[230]=
```
{{y[x] → InterpolatingFunction[ ⊞ Domain: {{0., 400.}}
                                Output: scalar ][x]}}
```

Out[231]=

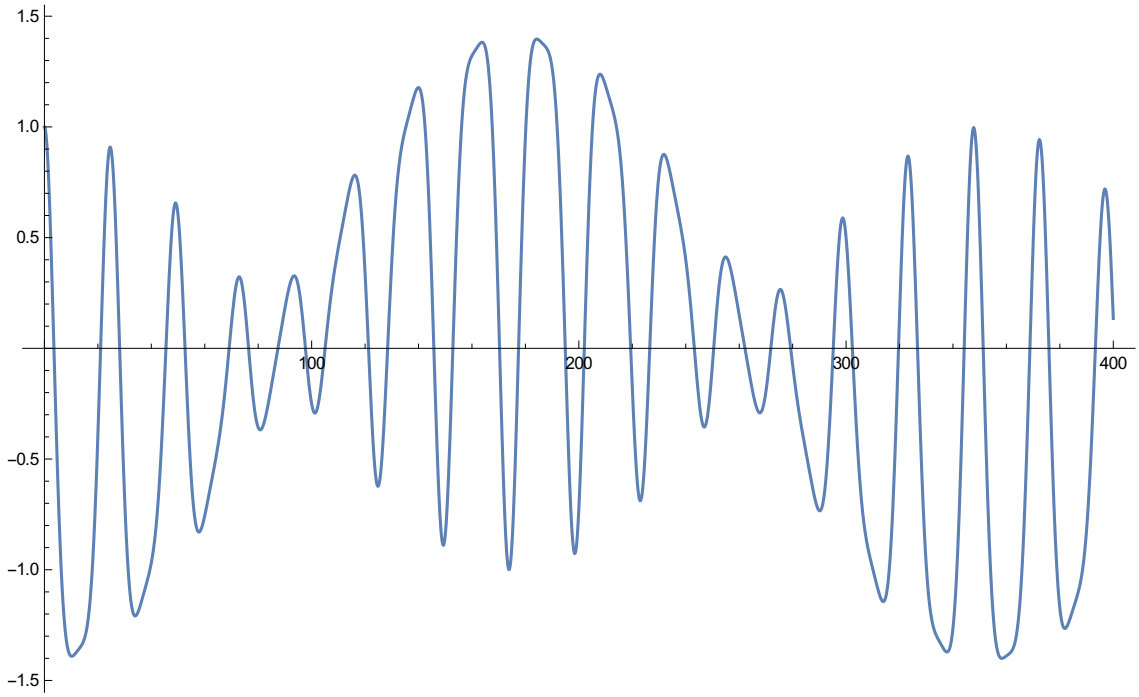



In[232]:=

In[273]:=
```
a = 0.1;
b = 0.1;
w = Sqrt[a] * 0.8;
s =
 NDSolve[{y''[x] + y[x] (a + b Cos[w x]) == 0, y[0] == 1, y'[0] == 0}, y[x], {x, 0, 400}]
Plot[Evaluate[y[x] /. s], {x, 0, 400}, PlotRange → All]
```

Out[276]=
```
{{y[x] → InterpolatingFunction[ ] [x]}}
```
Domain: {{0., 400.}}
Output: scalar

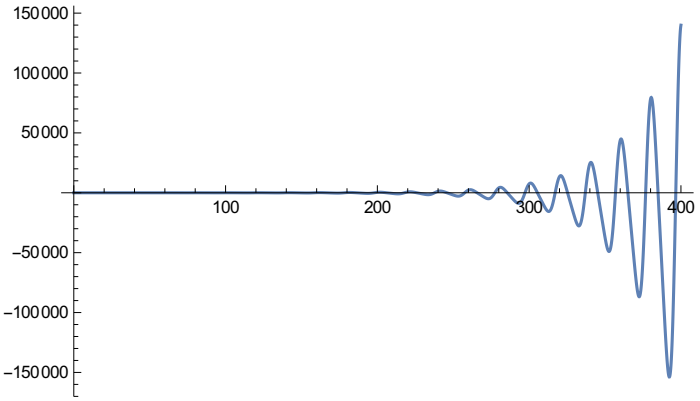
Out[277]=



In[278]:=
```
a = 0.1;
b = 0.1;
w = Sqrt[a];
s =
 NDSolve[{y''[x] + y[x] (a + b Cos[w x]) == 0, y[0] == 1, y'[0] == 0}, y[x], {x, 0, 400}]
Plot[Evaluate[y[x] /. s], {x, 0, 400}, PlotRange → All]
```

Out[281]=
```
{{y[x] → InterpolatingFunction[ ] [x]}}
```
Domain: {{0., 400.}}
Output: scalar

Out[282]=




In[283]:=
```
a = 0.1;
b = 0.1;
w = Sqrt[a] * 1.2;
s =
 NDSolve[{y''[x] + y[x] (a + b Cos[w x]) == 0, y[0] == 1, y'[0] == 0}, y[x], {x, 0, 400}]
Plot[Evaluate[y[x] /. s], {x, 0, 400}, PlotRange → All]
```

Out[286]=
```
{{y[x] → InterpolatingFunction[ ] [x]}}
```
Domain: {{0., 400.}}
Output: scalar

Out[287]=