

Fourier Series Solution 13.5.16

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a = 3
b = 2
fone[x_] = x
ftwo[x_] = a - x
g[y_] = y (b - y)

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Out[59]= 3

Out[60]= 2

Out[61]= x

Out[62]= 3 - x

Out[63]= (2 - y) y

```

In[75]:= Aone[j_, x_] = Sin[j Pi x / a]
         Btwo[j_, y_] = Sin[j Pi y / b]

```

Out[75]= $\text{Sin}\left[\frac{j \pi x}{3}\right]$

Out[76]= $\text{Sin}\left[\frac{j \pi y}{2}\right]$

```

In[103]:= ajone[j_] = (2 / a) (Integrate[fone[x] Aone[j, x], {x, 0, a / 2}] +
          Integrate[ftwo[x] Aone[j, x], {x, a / 2, a}]) / Sinh[j Pi b / a]

```

Out[103]= $\frac{2}{3} \text{Csch}\left[\frac{2 j \pi}{3}\right] \left(\frac{-\frac{9}{2} j \pi \text{Cos}\left[\frac{j \pi}{2}\right] + 9 \text{Sin}\left[\frac{j \pi}{2}\right]}{j^2 \pi^2} + \frac{9 \left(j \pi \text{Cos}\left[\frac{j \pi}{2}\right] + 2 \text{Sin}\left[\frac{j \pi}{2}\right] - 2 \text{Sin}[j \pi] \right)}{2 j^2 \pi^2} \right)$

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In[93]:= bjtwo[j_] = (2 / b) Integrate[g[y] Btwo[j, y], {y, 0, b}] / Sinh[j Pi a / b]

```

Out[93]= $-\frac{8 \text{Csch}\left[\frac{3 j \pi}{2}\right] (-2 + 2 \text{Cos}[j \pi] + j \pi \text{Sin}[j \pi])}{j^3 \pi^3}$

```

In[104]:= Bone[j_, y_] = ajone[j] Sinh[j Pi y / a]
         Atwo[j_, x_] = bjtwo[j] Sinh[j Pi x / b]

```

Out[104]= $\frac{2}{3} \text{Csch}\left[\frac{2 j \pi}{3}\right] \left(\frac{-\frac{9}{2} j \pi \text{Cos}\left[\frac{j \pi}{2}\right] + 9 \text{Sin}\left[\frac{j \pi}{2}\right]}{j^2 \pi^2} + \frac{9 \left(j \pi \text{Cos}\left[\frac{j \pi}{2}\right] + 2 \text{Sin}\left[\frac{j \pi}{2}\right] - 2 \text{Sin}[j \pi] \right)}{2 j^2 \pi^2} \right) \text{Sinh}\left[\frac{j \pi y}{3}\right]$

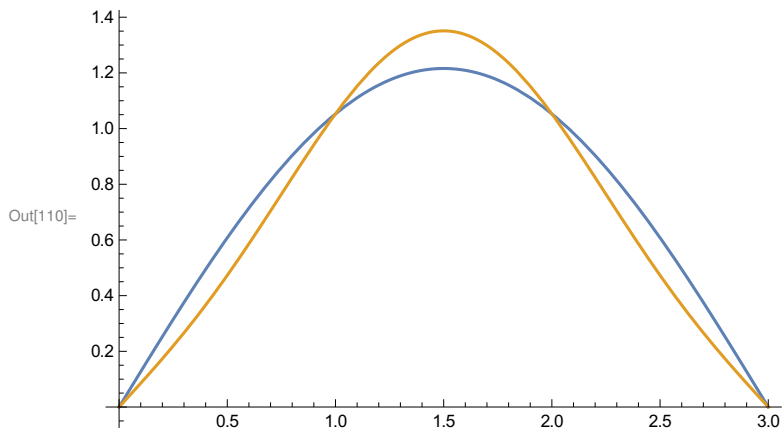
Out[105]= $-\frac{1}{j^3 \pi^3} 8 \text{Csch}\left[\frac{3 j \pi}{2}\right] (-2 + 2 \text{Cos}[j \pi] + j \pi \text{Sin}[j \pi]) \text{Sinh}\left[\frac{j \pi x}{2}\right]$

```
In[106]:= u[x_, y_, k_] :=
  Sum[Aone[j, x] Bone[j, y], {j, 1, k}] + Sum[Atwo[j, x] Btwo[j, y], {j, 1, k}]
```

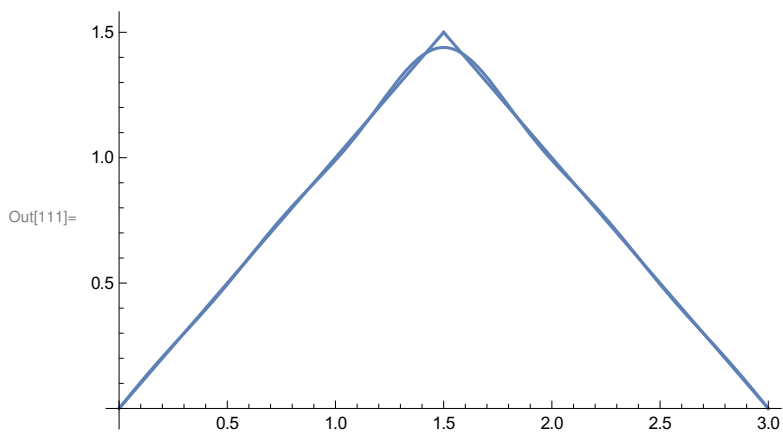
```
In[107]:= Plot[{u[x, b, 1], u[x, b, 2]}, {x, 0, a}]
```



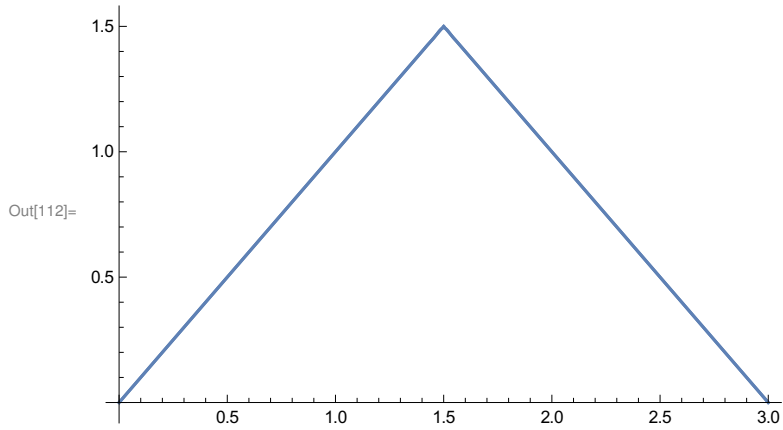
```
In[110]:= Plot[{u[x, b, 2], u[x, b, 4]}, {x, 0, a}]
```



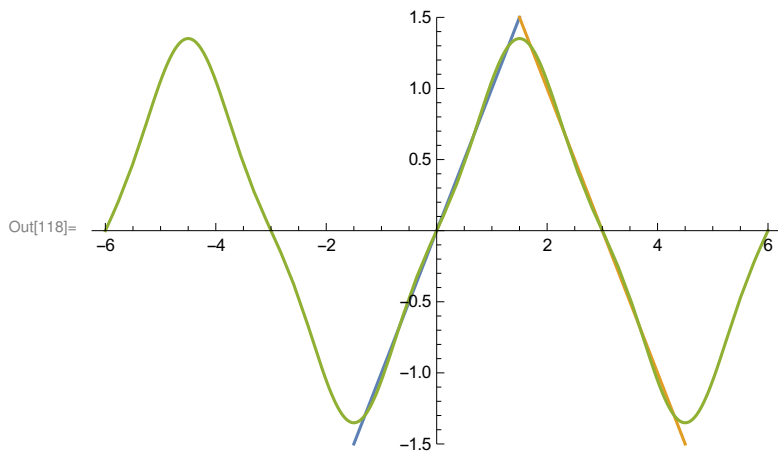
```
In[111]:= Show[Plot[u[x, b, 10], {x, 0, a}], Plot[fone[x], {x, 0, a/2}],
  Plot[ftwo[x], {x, a/2, a}], PlotRange -> All]
```



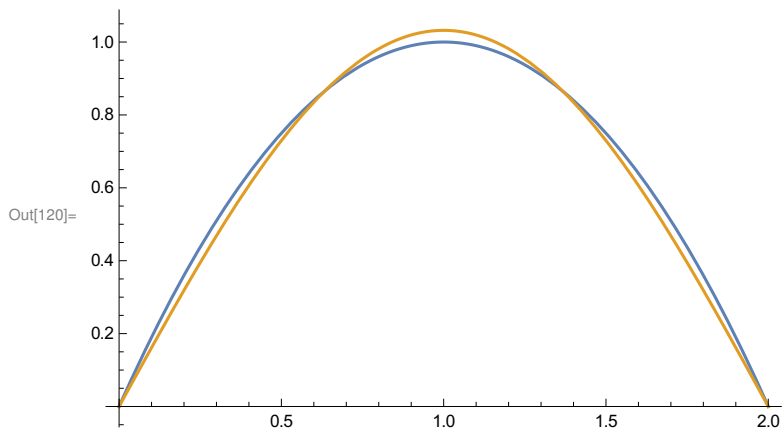
```
In[112]:= Show[Plot[u[x, b, 100], {x, 0, a}], Plot[fone[x], {x, 0, a/2}],
  Plot[ftwo[x], {x, a/2, a}], PlotRange -> All]
```



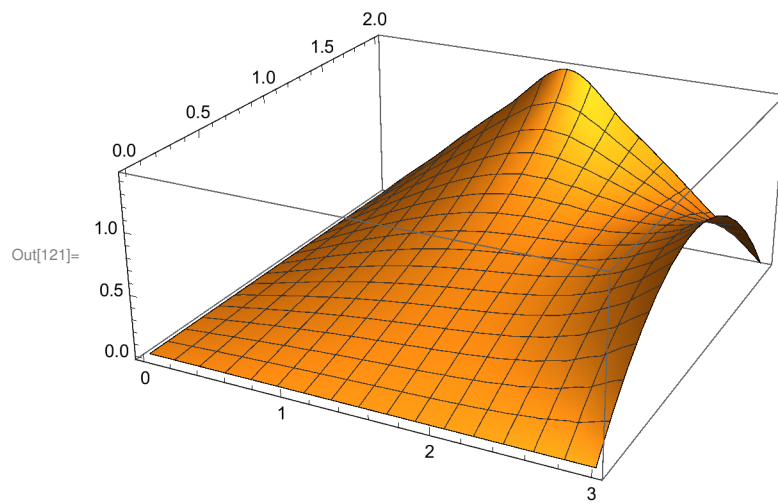
```
In[118]:= Plot[{fone[x], ftwo[x], u[x, b, 3]},
  {x, -2 a, 2 a}, PlotRange -> {-fone[a/2], fone[a/2]}]
```



```
In[120]:= Plot[{g[y], u[a, y, 1]}, {y, 0, b}]
```



```
In[121]:= Plot3D[u[x, y, 10], {x, 0, a}, {y, 0, b}, PlotRange -> All]
```



```
In[122]:= Plot3D[u[x, y, 100], {x, 0, a}, {y, 0, b}, PlotRange -> All]
```

