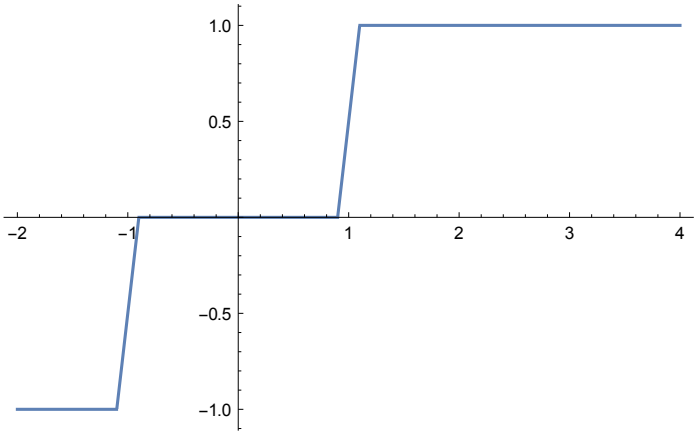
```
(* SOLUTION OF A D'ALEMBERT WAVE PROBLEM WITH
 NONZERO INITIAL DERIVATIVE (TESTA, 412 FALL '15) *)

(* The qualitative behavior of G is like this: *)
```

In[1]:=
```
gg[x_] := Piecewise[{{1, 1.1 <= x}, {-1, x <= -1.1}, {0, -.9 <= x ≤ .9},
   {5 (x - 1) + 0.5, .9 < x < 1.1}, {5 (x + 1) - 0.5, -1.1 < x < -.9}}]
```

In[2]:=
```
Plot[gg[x], {x, -2, 4}]
```

Out[2]=

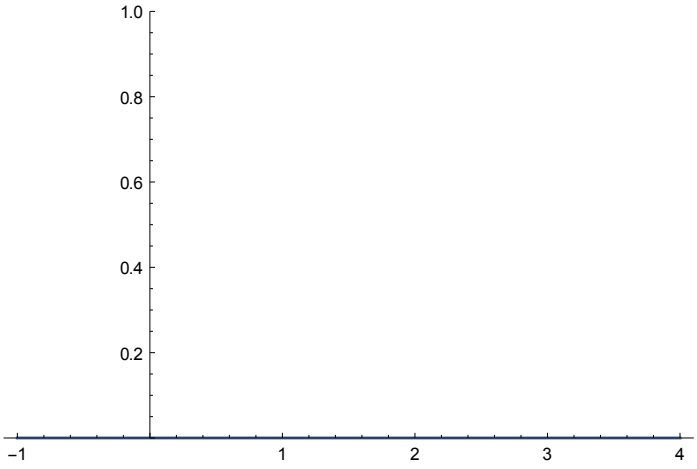



```
(* The details, including the height of the plateau, depend on the function h. *)
```

In[3]:=
```
u[x_, t_] := (1 / 2) (gg[x + t] - gg[x - t])
```

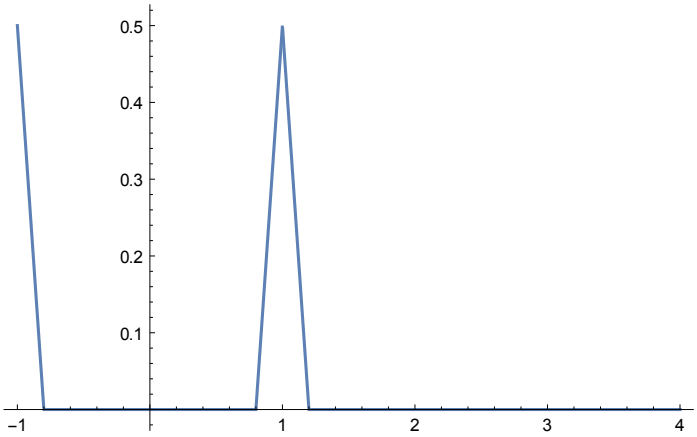
In[4]:=
```
Plot[u[x, 0], {x, -1, 4}, PlotRange → {0, 1}]
```

Out[4]=



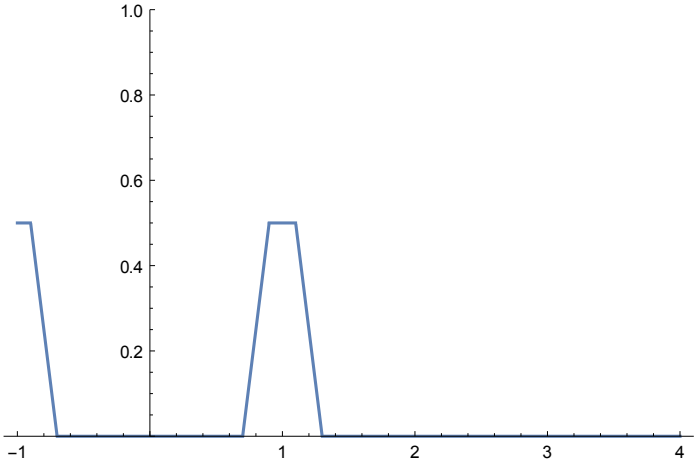
In[5]:=
```
Plot[u[x, 0.1], {x, -1, 4}]
```

Out[5]=



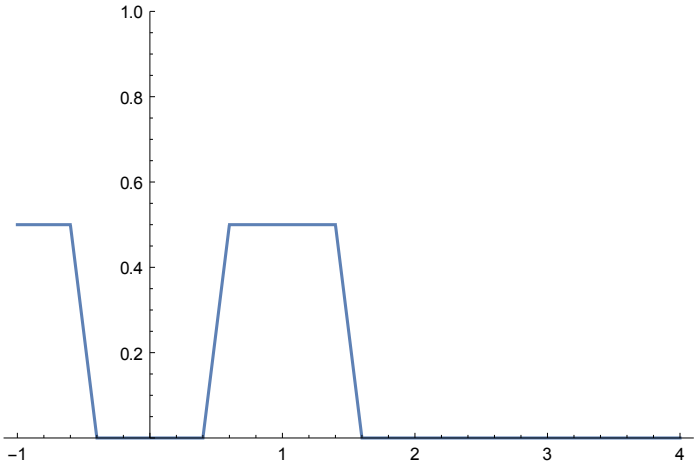

In[6]:=
```
Plot[u[x, 0.2], {x, -1, 4}, PlotRange → {0, 1}]
```

Out[6]=



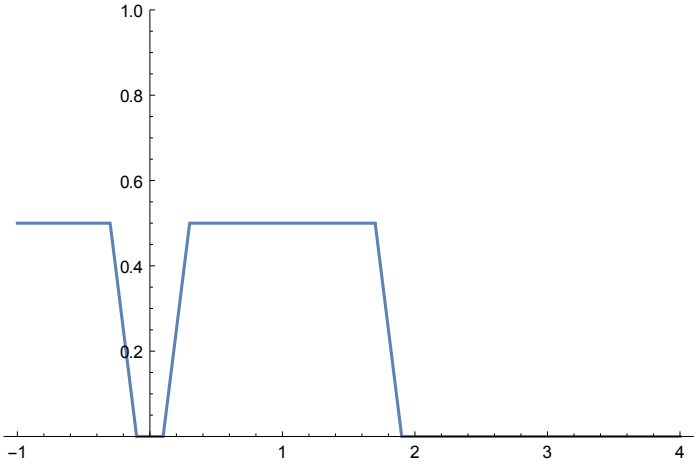

In[7]:=
```
Plot[u[x, 0.5], {x, -1, 4}, PlotRange → {0, 1}]
```

Out[7]=



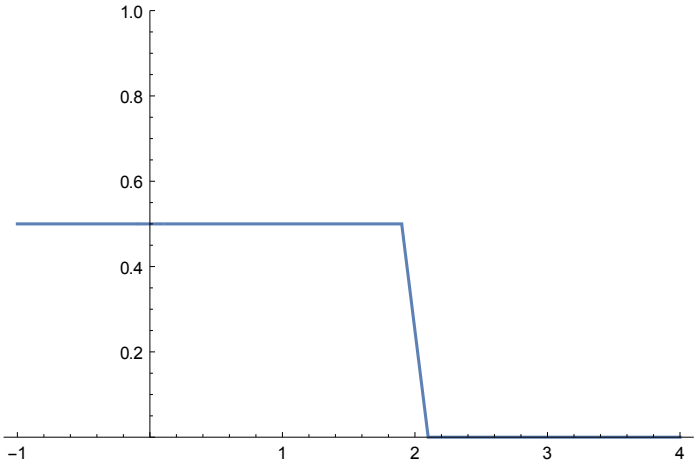
In[8]:=
```
Plot[u[x, 0.8], {x, -1, 4}, PlotRange → {0, 1}]
```

Out[8]=



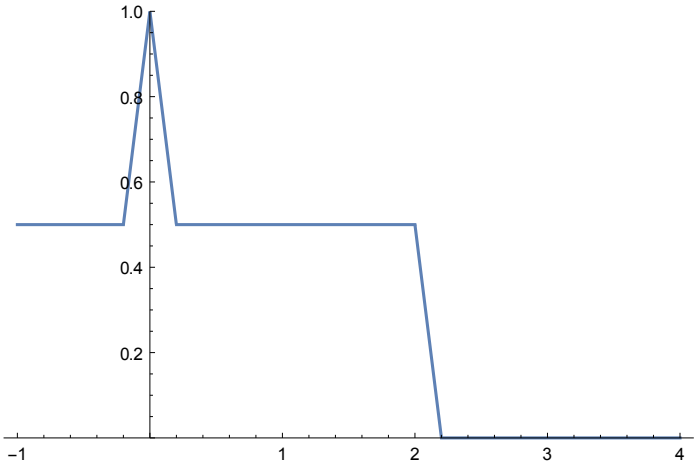

In[9]:=
```
Plot[u[x, 1], {x, -1, 4}, PlotRange → {0, 1}]
```

Out[9]=



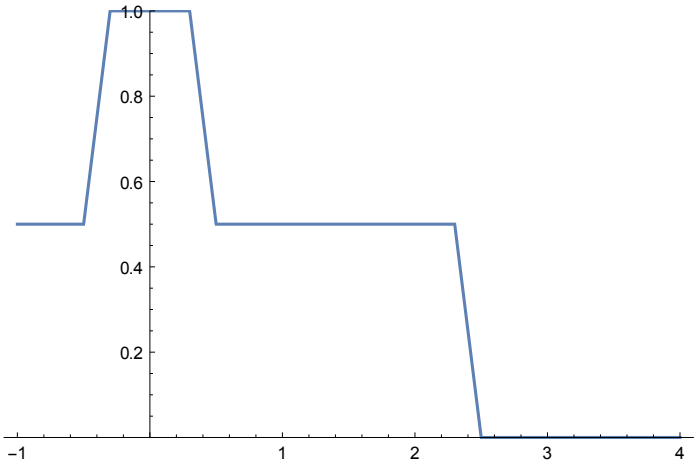

In[10]:=
```
Plot[u[x, 1.1], {x, -1, 4}, PlotRange → {0, 1}]
```

Out[10]=



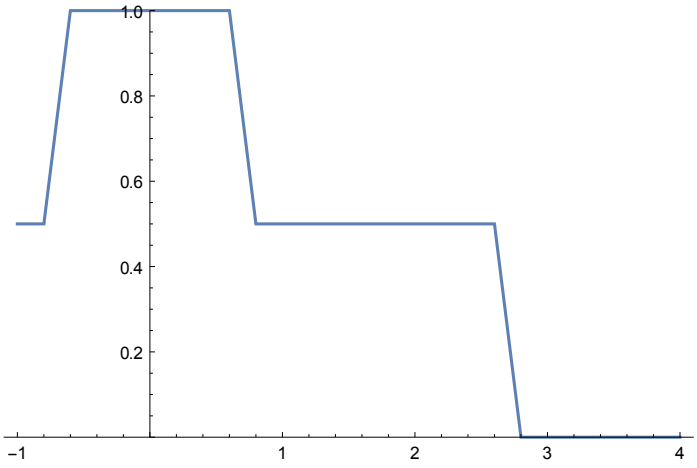
In[11]:=
```
Plot[u[x, 1.4], {x, -1, 4}, PlotRange → {0, 1}]
```

Out[11]=



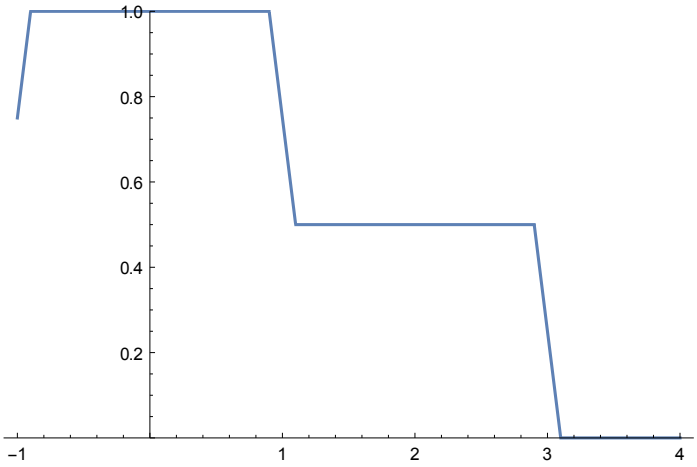

In[12]:=
```
Plot[u[x, 1.7], {x, -1, 4}, PlotRange → {0, 1}]
```

Out[12]=



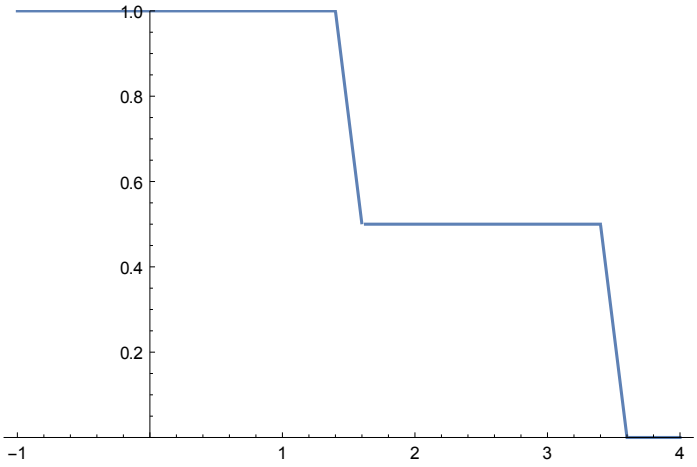

In[13]:=
```
Plot[u[x, 2], {x, -1, 4}, PlotRange → {0, 1}]
```

Out[13]=



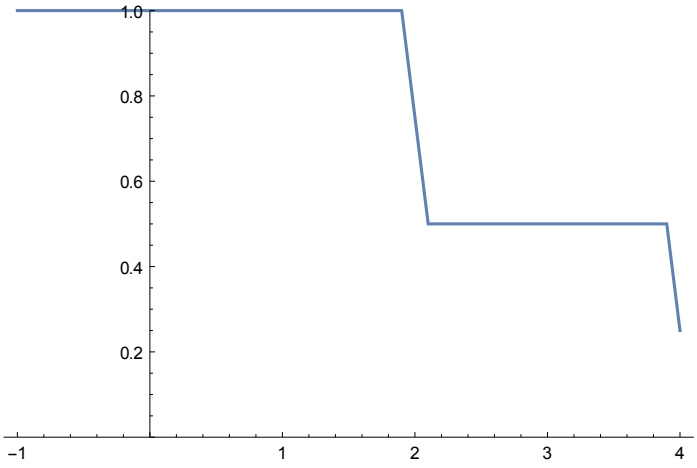
In[14]:=
```
Plot[u[x, 2.5], {x, -1, 4}, PlotRange → {0, 1}]
```

Out[14]=



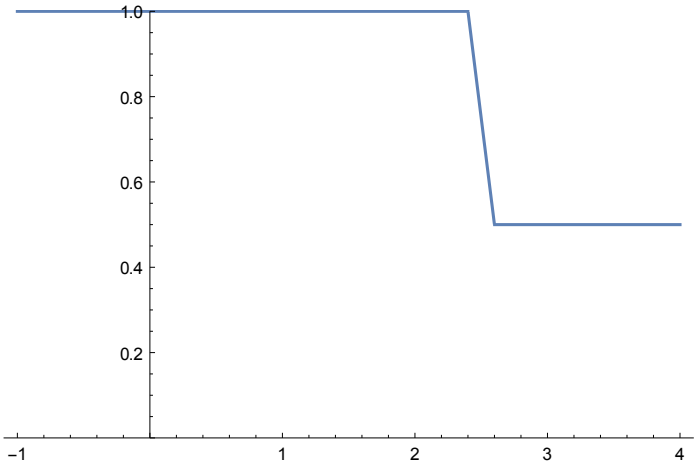

In[15]:=
```
Plot[u[x, 3], {x, -1, 4}, PlotRange → {0, 1}]
```

Out[15]=




In[16]:=
```
Plot[u[x, 3.5], {x, -1, 4}, PlotRange → {0, 1}]
```

Out[16]=



In[17]:=
```
Plot[u[x, 4], {x, -1, 4}, PlotRange → {0, 1}]
```

Out[17]=