In[25]:=
```
tri [x_] := UnitTriangle[x];
boxcar[x_] := UnitStep[x] - UnitStep[x - 1];
gaussian[x_] := (1/(2 Pi))^(1/2) * Exp[(-x^2)/2];
erf[x_] := ∫_{-∞}^{x} gaussian[y] ⅆy;
step[x_] := UnitStep[x];
estep[x_] := Exp[-x] step[x];
h[t_, x_] := (1/((2 t)^(1/2))) * gaussian[x * 1/((2 t)^(1/2))];
```

In[∘]:=
```
h[t, x]
```

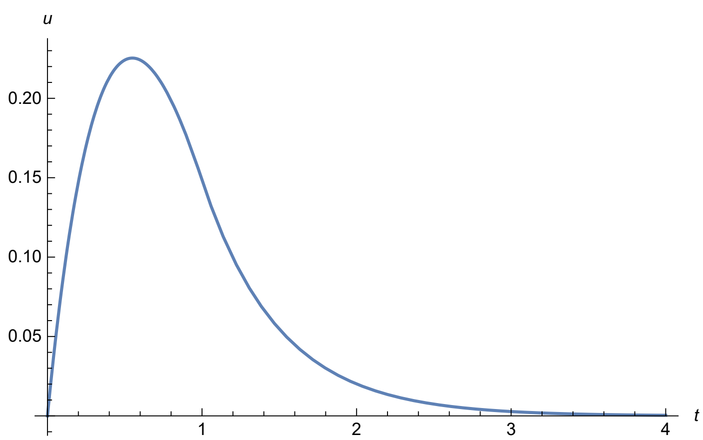
Out[∘]=

$$\frac{e^{-\frac{x^2}{4 t}}}{2 \sqrt{\pi} \sqrt{t}}$$

In[∘]:=
```
ode21[t_] := ∫_0^t ⅇ^(-2 (t - τ)) tri[τ] ⅆτ
```

In[∘]:=
```
Plot[ode21[t], {t, 0, 4}, AxesLabel → {t, u}]
```

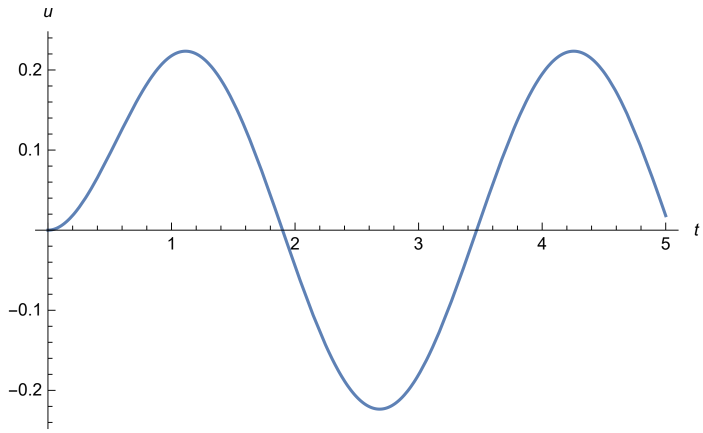
Out[∘]=



In[35]:=
```
ode22[t_] := 1/2 NIntegrate[Sin[2 (t - τ)] tri[τ], {τ, 0, t}]
```

In[37]:=
```
Plot[ode22[t], {t, 0, 5}, AxesLabel → {t, u}]
```

Out[37]=



In[•]:=
```
τ2[t_, x_] = x + t;
ξ2[t_, x_] = x - t;
```

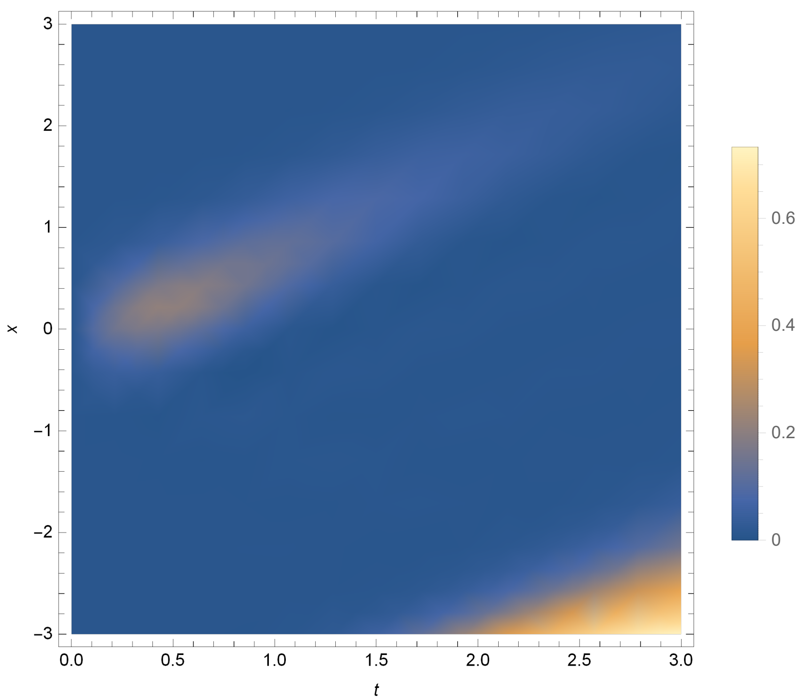
In[•]:=
$$\text{pde23[t\_, x\_] := } \frac{1}{2} \text{Exp}\left[\frac{-\tau 2}{2}\right] \int_0^{\tau 2[t,x]} \text{Exp[s] tri[}\tau\text{2[t, x]] tri[}\xi\text{2[t, x]]} \, ds$$

In[•]:=
```
s = NDSolve[{D[u[t, x], t] + u[t, x] + D[u[t, x], x] == tri[x + t] tri[x - t], u[0, x] == 0},
    u, {t, 0, 3}, {x, -3, 3}];
```

NDSolve: Warning: an insufficient number of boundary conditions have been specified for the direction of independent variable x. Artificial boundary effects may be present in the solution.

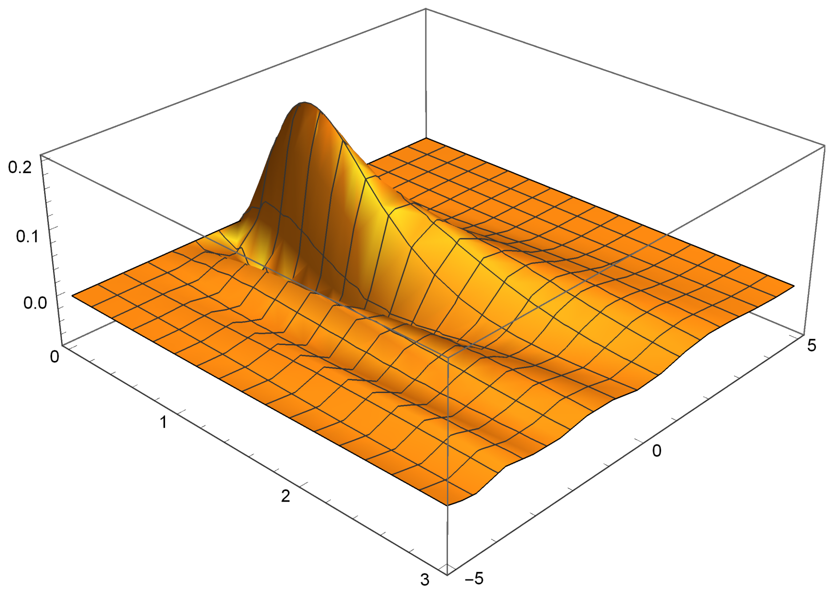
In[•]:=
```
DensityPlot[Evaluate[u[t, x] /. s], {t, 0, 3}, {x, -3, 3}, PlotRange → All,
  FrameLabel → {t, x}, PlotLegends → Automatic, PerformanceGoal → "Quality"]
```

Out[•]=



In[ ]:=
```
Plot3D[Evaluate[u[t, x] /. s], {t, 0, 3},
 {x, -5, 5}, PlotRange → All, PlotLegends → Automatic]
```

Out[ ]=

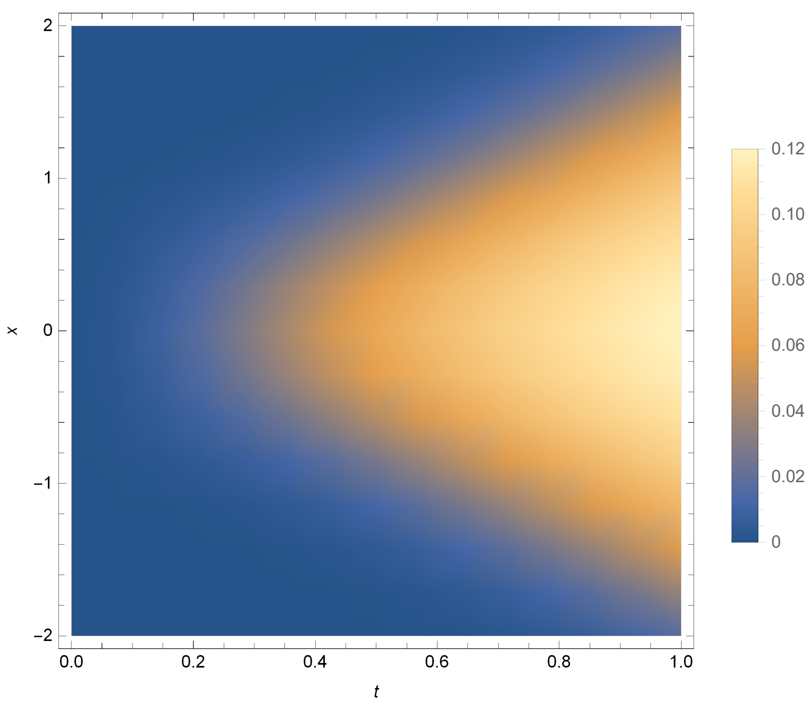


In[ ]:=

$$\text{pde24[t\_, x\_] :=}\ \frac{1}{4}\int_0^t\int_{x-2\,(t-\tau)}^{x+2\,(t-\tau)} \text{tri[y] tri[}\tau\text{]}\, dy\, d\tau$$

```
DensityPlot[pde24[t, x], {t, 0, 3}, {x, -3, 3},
 PerformanceGoal → "Quality", FrameLabel → {t, x}, PlotLegends → Automatic]
```

Out[ ]=



In[38]:=
```
pde25[t_, x_] :=
 NIntegrate[NIntegrate[(tri[y] tri[τ - 2]) h[t - τ, x - y], {y, -∞, ∞}], {τ, 0, t}]
```

```
DensityPlot[pde25[t, x], {t, 0, 4}, {x, -1, 1},
 PerformanceGoal → "Quality", FrameLabel → {t, x}, PlotLegends → Automatic]
```

Out[ ]=