

Temperature Distribution in a Cold Region With a Heated Surface

Dennis Silverman
Mathematical Physics 212 B
U. C. Irvine

■ Temperature at surface is 1, length L is 1, diffusion constant $\kappa = 1$.

■ One Dimensional Plate Distribution

In[1]:= ? Sum

Sum[f, {i, imax}] evaluates the sum of the expressions f as evaluated for each i from 1 to imax. Sum[f, {i, imin, imax}] starts with i = imin. Sum[f, {i, imin, imax, di}] uses steps di. Sum[f, {i, imin, imax}, {j, jmin, jmax}, ...] evaluates a sum over multiple indices.

In[55]:= Tsum := 1 - (4 / Pi) Sum[(1 / n) Sin[n Pi x] Exp[-n^2 Pi^2 t], {n, 1, 11, 2}]

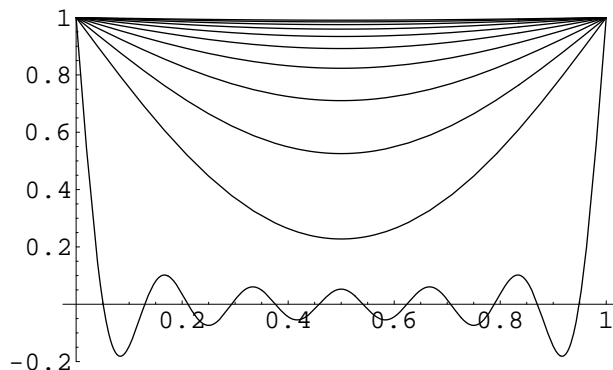
In[67]:= t = .

In[68]:= Tsum

Out[68]= $1 - \frac{1}{\pi} \left(4 \left(E^{-\pi^2 t} \sin[\pi x] + \frac{1}{3} E^{-9 \pi^2 t} \sin[3 \pi x] + \frac{1}{5} E^{-25 \pi^2 t} \sin[5 \pi x] + \frac{1}{7} E^{-49 \pi^2 t} \sin[7 \pi x] + \frac{1}{9} E^{-81 \pi^2 t} \sin[9 \pi x] + \frac{1}{11} E^{-121 \pi^2 t} \sin[11 \pi x] \right) \right)$

In[64]:= tabplot := Table[Tsum, {t, 0, .5, .05}]

In[65]:= Plot[Evaluate[tabplot], {x, 0, 1}, PlotRange -> {-0.2, 1}]



Out[65]= - Graphics -

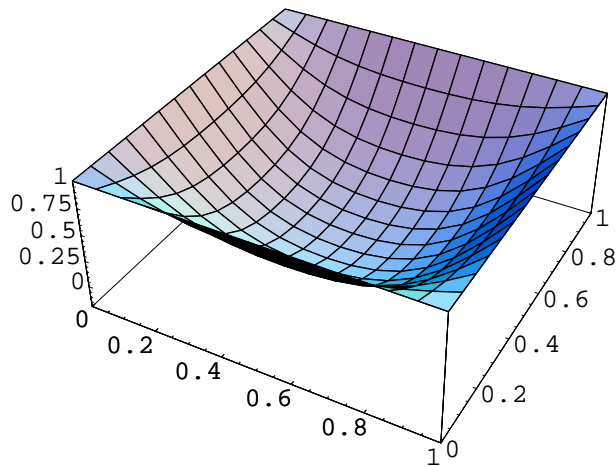
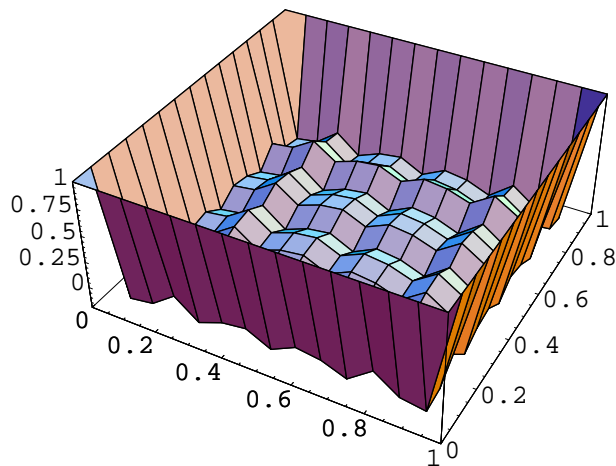
■ Two Dimensional Rectangular Box Distribution

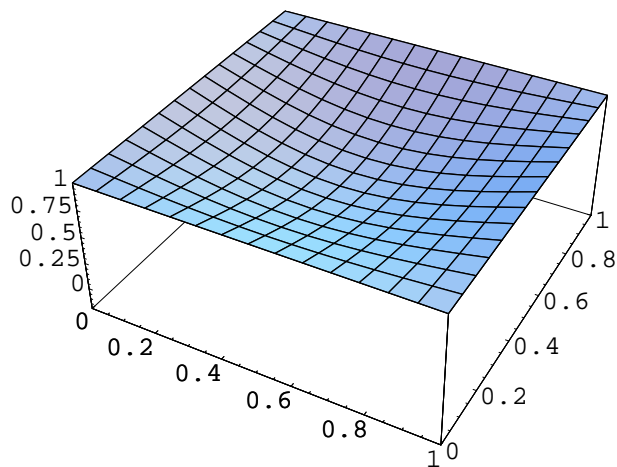
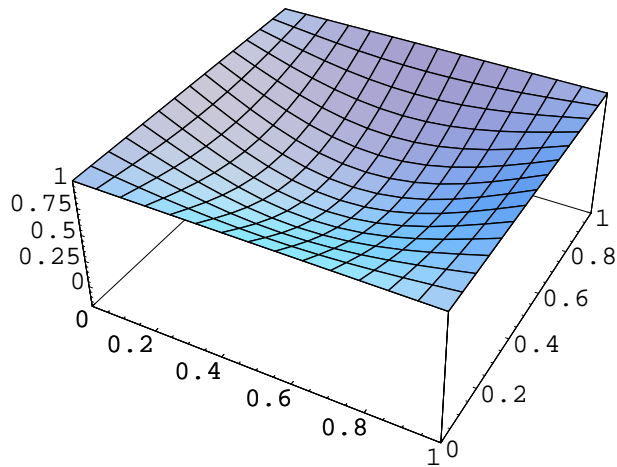
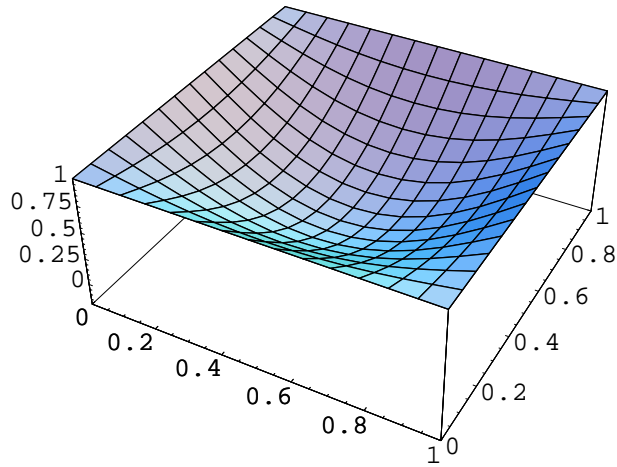
In[69]:= ? Sum

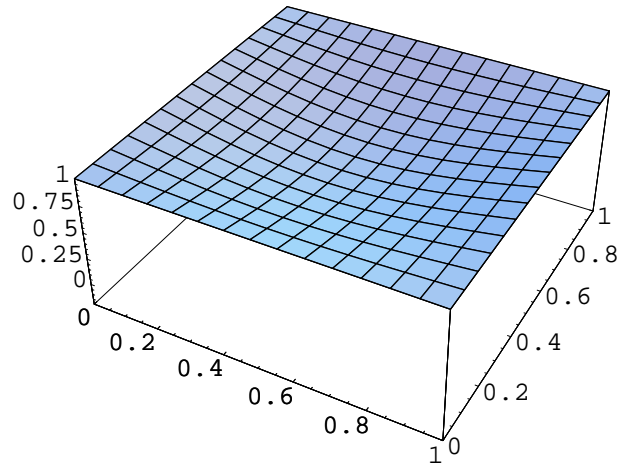
Sum[f, {i, imax}] evaluates the sum of the expressions f as evaluated for each i from 1 to imax. Sum[f, {i, imin, imax}] starts with i = imin. Sum[f, {i, imin, imax, di}] uses steps di. Sum[f, {i, imin, imax}, {j, jmin, jmax}, ...] evaluates a sum over multiple indices.

In[70]:= Tsum2 := 1 -
 (16 / π^2) Sum[1 / (k m) Sin[k π x] Sin[m π y] Exp[-(k² + m²) π^2 t], {k, 1, 9, 2}, {m, 1, 9, 2}]

In[76]:= Table[Plot3D[Evaluate[Tsum2], {x, 0, 1}, {y, 0, 1}, PlotRange -> {-0.2, 1}],
 {t, 0, 0.1, .02}]







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Out[76]= {- SurfaceGraphics -, - SurfaceGraphics -, - SurfaceGraphics -, - SurfaceGraphics -,  
          - SurfaceGraphics -, - SurfaceGraphics -}
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In[77]:= ShowAnimation[%]
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