

**In[ ]:= PDE2D = D[T2D[r, t], t] - k (D[D[T2D[r, t], r], r]) == 0**

**Out[ ]:=**  
 $T2D^{(0,1)}[r, t] - k T2D^{(2,0)}[r, t] == 0$

**In[ ]:= PDE3D = D[T3D[r, t], t] - k (D[D[T3D[r, t], r], r] + D[T3D[r, t], r] / r) == 0**

**Out[ ]:=**  
 $T3D^{(0,1)}[r, t] - k \left( \frac{T3D^{(1,0)}[r, t]}{r} + T3D^{(2,0)}[r, t] \right) == 0$

**In[ ]:= InitCond2D = T2D[r, 0] == DT2d**

**Out[ ]:=**  
 $T2D[r, 0] == DT2d$

**In[ ]:= InitCond3D = T3D[r, 0] == DT3d**

**Out[ ]:=**  
 $T3D[r, 0] == DT3d$

**In[ ]:= BondCond2D1 = T2D[R2D, t] == 0**

**Out[ ]:=**  
 $T2D[R2D, t] == 0$

**In[ ]:= BondCond2D2 = T2D[-R2D, t] == 0**

**Out[ ]:=**  
 $T2D[-R2D, t] == 0$

**In[ ]:= BondCond3D1 = T3D[R3D, t] == 0**

**Out[ ]:=**  
 $T3D[R3D, t] == 0$

**In[ ]:= BondCond3D2 = D[T3D[r, t], r][0, t] == 0**

**Out[ ]:=**  
 $T3D^{(1,0)}[r, t][0, t] == 0$

**In[ ]:= DSolve[{PDE2D, InitCond2D, BondCond2D1, BondCond2D2}, T2D[r, t], {r, t}]**

**Out[ ]:=**  

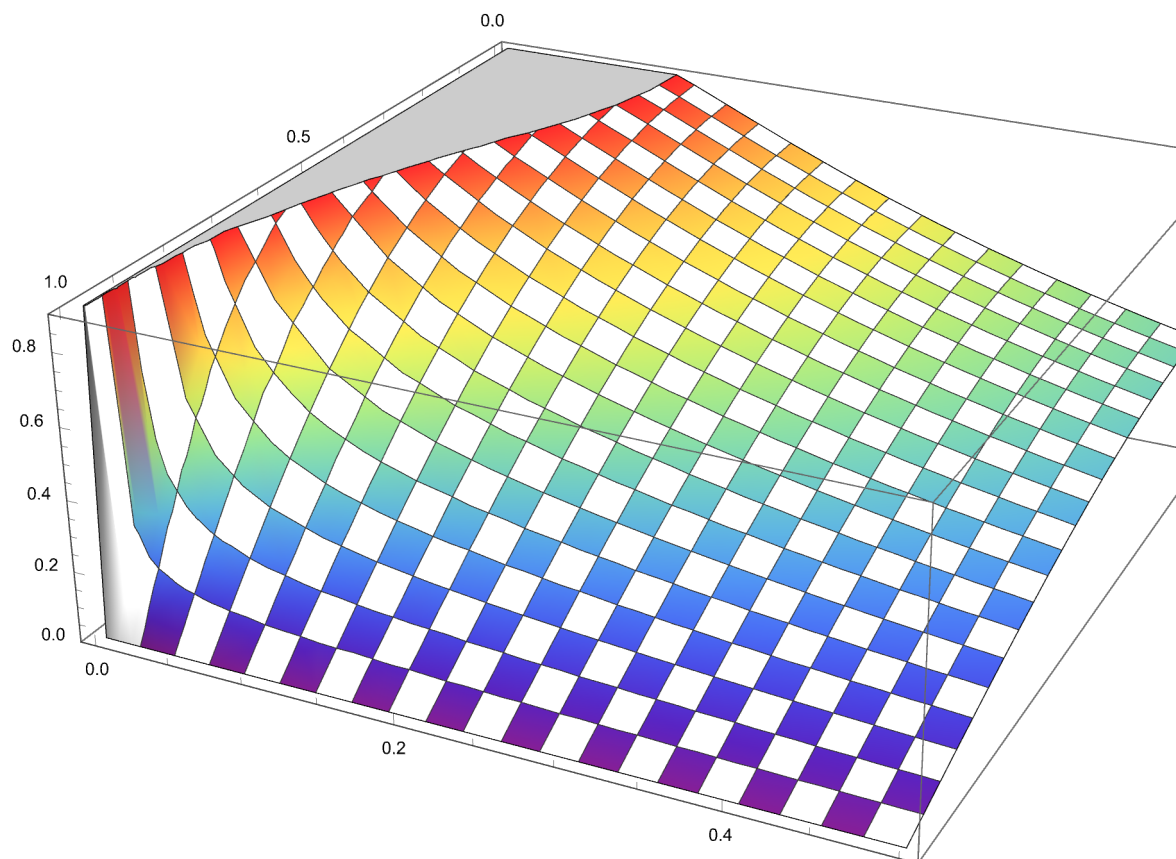
$$\left\{ \left\{ T2D[r, t] \rightarrow \sum_{K[1]=1}^{\infty} \frac{2 \left( -1 + (-1)^{K[1]} \right) DT2d e^{-\frac{k \pi^2 t K[1]^2}{4 R2D^2}} \sin \left[ \frac{\pi (-r - R2D) K[1]}{2 R2D} \right]}{\pi K[1]} \right\} \right\}$$

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In[ ]:= Plot3D[Sum[2 (-1 + (-1)^K) e^(-1/4 pi^2 t K^2) Sin[1/2 pi (1+r) K], {K, 1, 300}], {r, 0.0, 1.0},
{t, 0.0, 0.5}, PlotRange -> {0, 0.90}, Mesh -> 20, MeshFunctions -> {#1 &, #2 &},
MeshShading -> {{White, Automatic}, {Automatic, White}},
ColorFunction -> "Rainbow", PerformanceGoal -> "Quality"]

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Out[ ]:=



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In[ ]:= DSolve[{PDE3D, InitCond3D, BondCond3D1, BondCond3D2}, T3D[r, t], {r, t}]

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Out[ ]:=

{ { T3D[r, t] ->

$$\sum_{K[1]=1}^{\infty} \left\{ \frac{2 \text{DT3d} e^{-\frac{k t \text{BesselJZero}[0, K[1]]^2}{R3D^2}} \text{BesselJ}\left[0, \frac{r \text{BesselJZero}[0, K[1]]}{R3D}\right]}{\text{BesselJ}[1, \text{BesselJZero}[0, K[1]]] \text{BesselJZero}[0, K[1]]} \right\}$$

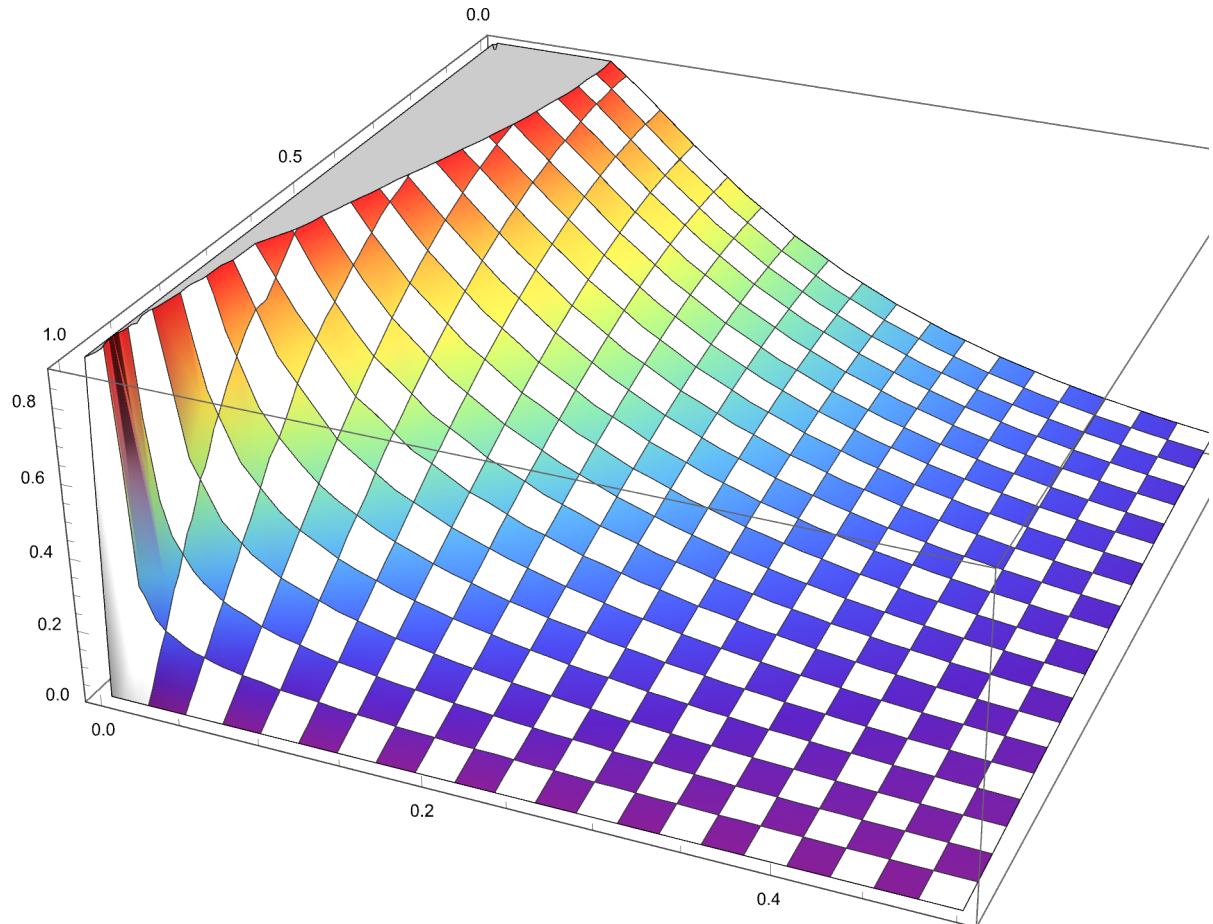
if  $\text{Re}[\text{BesselJZero}[0, K[1]]] \geq 0 \&\&$   
 $(\text{Im}[\text{BesselJZero}[0, K[1]]] > 0 \mid \mid \text{Re}[\text{BesselJZero}[0, K[1]]] > 0)$

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In[ ]:= Plot3D[Sum[2 e^(-t BesselJZero[0,K]^2) BesselJ[0, r BesselJZero[0, K]]
  BesselJ[1, BesselJZero[0, K]] BesselJZero[0, K], {r, 0.0, 1.0},
  {t, 0.0, 0.5}, PlotRange -> {0, 0.90}, Mesh -> 20, MeshFunctions -> {#1 &, #2 &},
  MeshShading -> {{White, Automatic}, {Automatic, White}},
  ColorFunction -> "Rainbow", PerformanceGoal -> "Quality"]

```

Out[ ]=



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In[ ]:= Assuming[m ∈ Integers && m > 0 && (m + 1) / 2 ∈ Integers,

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  Refine[1/R2D Integrate[2 (-1 + (-1)^m) e^(-k π^2 t m^2 / (4 R2D^2)) DT2d Sin[π (-r - R2D) m / (2 R2D)], {r, 0, R2D}]]]

```

Out[ ]=

$$\frac{8 \text{DT2d} e^{-\frac{k m^2 \pi^2 t}{4 R2D^2}}}{m^2 \pi^2} \quad \text{if } R2D \in \mathbb{R}$$

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In[ ]:= Assuming[n ∈ Integers && n > 0, Refine[

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  1/R3D Integrate[2 DT3d e^(-k t BesselJZero[0,n]^2 / R3D^2) BesselJ[0, r BesselJZero[0,n] / R3D]
  BesselJ[1, BesselJZero[0, n]] BesselJZero[0, n], {r, 0, R3D}]]]

```

Out[ ]=

$$\frac{\text{DT3d} e^{-\frac{k t \text{BesselJZero}[0,n]^2}{R3D^2}} \pi \text{StruveH}[0, \text{BesselJZero}[0, n]]}{\text{BesselJZero}[0, n]}$$