# Hilbert's 13th Problem

```
SetDirectory["C:\\drorbn\\AcademicPensieve\\2014-11\\H13"]
```

```
C:\drorbn\AcademicPensieve\2014-11\H13
```

Pensieve Header: Hilbert's 13th problem - Step 2 (2014 Branch).

```
<< "../../2009-11/Hilbert13th-Program.m"
```

```
ϕ1 := Phi[Identity, 2, 0.3, 2 / 3];
ϕ2 := Phi[ϕ1, 12, 0, 0.95];
```

```
phi1 := Phi[Identity, 2, 0.3, 2 / 3];
phi2 := Phi[phi1, 12, 0, 0.8];
phi3 := Phi[ϕ, ϕ0 → phi1, Subdivisions → 12, Slope → 0, FillFactor → 0.8];
g1 = G[f, phi1];
g2 = G[f, phi2];
```

```
Step2Cascade = Rasterize[
    Plot3D[ϕ2[x] + λ * ϕ2[y], {x, 0, 1}, {y, 0, 1},
     PlotPoints → 479, Mesh → 23, ViewPoint → {-2, -2, 1},
     NormalsFunction → None, Boxed → False, Axes → None,
     ColorFunction → Automatic, ColorFunctionScaling → True
    ]
  ];
```

```
Export[
 "Step2Cascade.png",
 ImageCrop[Step2Cascade]
]
```

```
Step2Cascade.png
```

```
res = 4000;
Timing[
 Step2CascadeWithG2 = Rasterize[
    Plot3D[phi2[x] + λ * phi2[y], {x, 0, 1}, {y, 0, 1},
     PlotPoints → 3 res / 4 - 1, Mesh → 11, ViewPoint → {-2, -2, 1},
     NormalsFunction → None, ColorFunction → (Hue[g2[#3]] &),
     ImageSize → res, Axes → None, Boxed → False
    ], ImageSize → res, RasterSize → res
   ];
]
```

InterpolatingFunction::dmval :

Input value $\{6.93443 \times 10^{-7}\}$ lies outside the range of data in the interpolating function. Extrapolation will be used. ≫

InterpolatingFunction::dmval :

Input value {0.1} lies outside the range of data in the interpolating function. Extrapolation will be used. ≫

InterpolatingFunction::dmval :

Input value {0.1} lies outside the range of data in the interpolating function. Extrapolation will be used. ≫

General::stop : Further output of InterpolatingFunction::dmval will be suppressed during this calculation. ≫

```
{2.932819, Null}
```

```
Export[
 "Step2CascadeWithG2.png",
 Step2CascadeWithG2, ImageSize → res, RasterSize → res
]
```

```
Step2CascadeWithG2.png
```