```
restart;
# DEFINITION VARIABLES
d := 2 : # DIMENSION, 2 POUR LES IMAGES
m := 2 d : # NBRES DE FCTS EXTERNES -1
Δ := 10 : # BASE UTILISE, PLUS = MIEUX
b := 1/(Δ(Δ − 1)) :
λ1 := 1 :
λ2 := evalf( sum(1/Δ^(2^r − 1), r = 1 .. ∞) );
```

0.1010001000 **(1)**

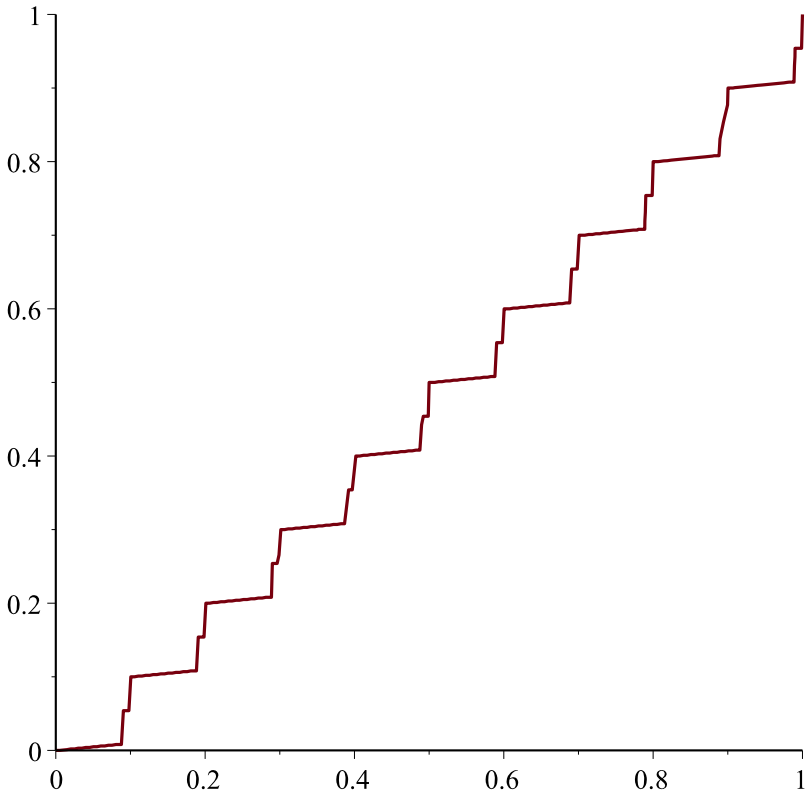
```
# DONNE LA I EME DECIMAL EN BASE Δ DE K
ieme := (k, i) → floor(Δ·(k·Δ^(i − 1) − floor(k·Δ^(i − 1)))) :

# TRONQUE LE REEL D AU K PREMIERE DECIMALS EN BASE Δ
dk := (d, k) → floor(ieme(d, w)·Delta) :

# AJOUTE 0.0ppppppp (K FOIS p) EN BASE Δ A D
dkn := (d, k, p) → piecewise(d + p·sum(Δ^(−w), w = 2 .. k) < 1, d + p·sum(Δ^(−w), w = 2 .. k), dkn(0, k, Δ − 1)) :

# DEFINITION DES FONCTIONS INTERNES
ψ := (d, k) → piecewise(k = 1, d, ieme(d, k) < Δ − 1, ψ(d − ieme(d, k)/Δ^k, k − 1) + ieme(d, k)/Δ^(2^k − 1),
    1/2·(ψ(d − 1/Δ^k, k) + ψ(d + 1/Δ^k, k − 1))) :
plot(x → ψ(x, 10), 0 .. 1);

# DEFINITION DE "LA" FCT INTERNE
ξ := (x1, x2) → λ1·ψ(x1, 5) + λ2·ψ(x2, 5) :
plot3d(ξ, 0 .. 1, 0 .. 1, axes = BOXED, numpoints = 600);
```


1
0.8
0.6
0.4
0.2
0
0
0.2
0.4
0.6
0.8
1

Maple is unable to render 3D graphics.

Your operating system, graphics, or video driver may require updating.

See "gldriver" in the help system for more information.

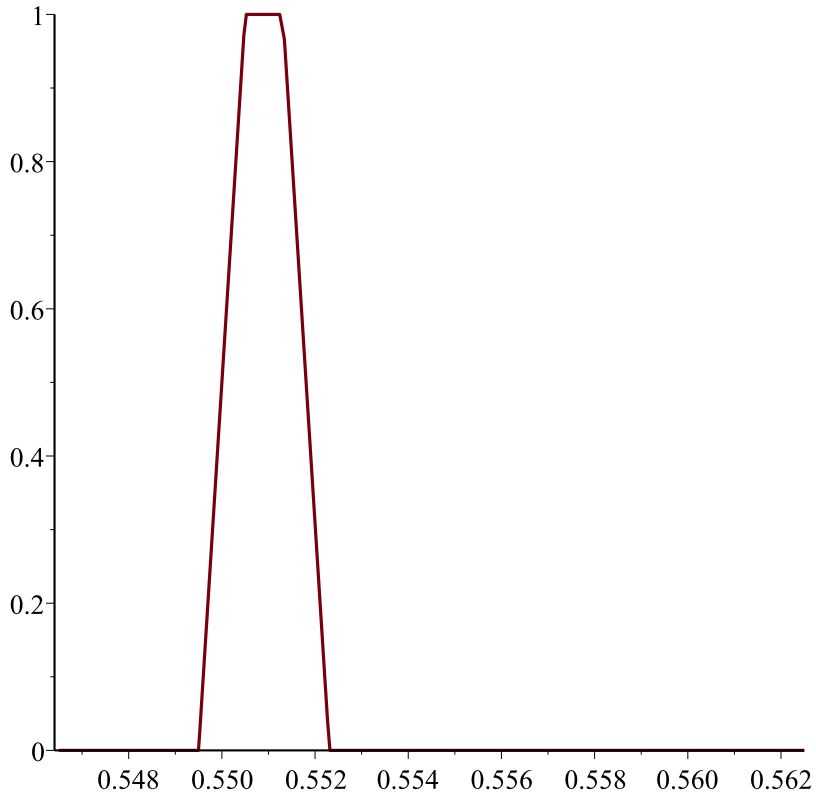
IllegalArgumentException

Width (0) and height (0) must be > 0

```
# FCT NECESSAIRES AU CALCUL DES FONCTIONS EXTERNES
σ := x → piecewise(x ≥ 1, 1, x ≤ 0, 0, x) :

c := x→λ[2]·sum(1/(Δ^(d^h) - 1), h = x + 1 .. ∞) :

θ := (x1, x2, k, y) → evalf(σ(Δ^(d^(k+1) - 1)·(y - ξ(x1, x2, 10)) + 1) - σ(Δ^(d^(k+1) - 1)·(y - ξ(x1, x2, 10)
    - (Δ - 2)·c(k))))) :
plot(x→θ(.5, .5, 1, x), (ξ(.5, .5, 10) - .004)..(ξ(.5, .5, 10) + .012), resolution = 20, numpoints
    = 20); # TEST
```




```
# DEFINITION DE LA FCT A COMPRESSER
with(ImageTools) :

img := Read("lena.bmp") :
taille := Width(img) :

Preview(img);

val := (y1, y2, x) → y1 + (y2 − y1) · (x − floor(x)) :
fimg := (x, y) → piecewise(x = 1 taille and y = taille, img[taille][taille], x = taille,
      val(img[floor(y)][taille], img[floor(y) + 1][taille], y), y = taille, val(img[taille][floor(x)],
     img[taille][floor(x) + 1], x)
, val(val(img[floor(y)][floor(x)], img[floor(y)][floor(x) + 1], x), val(img[floor(y)
      + 1][floor(x)], img[floor(y) + 1][floor(x) + 1], x) , y)) :
fct := (x, y) →fimg(x · (taille − 1) + 1, y · (taille − 1) + 1) :

plot3d( fct, 0 ..1, 0 ..1, axes = BOXED, grid = [100, 100]);
```

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IllegalArgumentException

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```
# DEFINITION DES NORMES UTILISES
 norminfderiv := proc(f) local maxn, x, y :
    maxn := 0;
    for y from 2 to taille do
       for x from 2 to taille do
          if evalf(|f(x - 1, y) - f(x, y)|) > maxn then maxn := f(x - 1, y) - f(x, y) fi :
          if evalf(|f(x, y - 1) - f(x, y)|) > maxn then maxn := f(x, y - 1) - f(x, y) fi:
       od;
    od;
    return maxn;
 end proc:

 norminf := proc(f) local maxn, x, y :
    maxn := 0;
    for y from 1 to taille do
       for x from 1 to taille do
          if f(x, y) > maxn then maxn := f(x, y) fi :
       od;
    od;
    return maxn;
```

end proc:

 # PRECISION SOUHAITE
$\varepsilon := .01$:*# POUR LA FCT*
$r := 1$: *# NBRE DE FOIS QU'ON EXECUTE LA BOUCLE*

 # OBTENTION DES FCTS EXTERNES
$f[0] := fct$:

for t **from** 1 **to** r **do**

$$k := evalf\left(1 + \mathrm{floor}\left(\frac{\log\left(\varepsilon \frac{norminf(fimg)}{norminfderiv(fimg)}\right)}{-\log(\Delta)}\right)\right);$$

for l **from** 0 **to** m **do**

$$g[t, l] := e \to \frac{1}{m+1}\left(add\left(add\left(f[evalf(t-1)]\left(dk\left(\frac{1}{\Delta^k}, k\right), dk\left(\frac{ay}{\Delta^k}, k\right)\right)\cdot\theta\left(dkn\left(\frac{1}{\Delta^k}, k, l\right), dkn\left(evalf\left(\frac{ay}{\Delta^k}\right), k, l\right), k, e\right), ay = 1..\Delta^k\right), ax = 1..\Delta^k\right)\right);$$

od;

$$f[t] := (x, y) \to f[0](x, y) - add\left(add\left(g[1, s]\left(\xi(x + s\cdot b, y + s\cdot b)\right), j = 1..t\right), s = 0..m\right);$$

od:

$\#f[1](.5, .5)$;
$\#f[0](.5, .5)$;

for t **from** 1 **to** r **do**

$$g[t] := x \to \sum_{j=1}^{r} g[j, t];$$

od:

Warning, computation interrupted
 # CREATION DE LA NOUVELLE FONCTION

$$newfct := (x, y) \to \sum_{i=0}^{m} g[i]\left(\xi(x + b\cdot i, y + b\cdot i)\right) :$$

 # AFFICHAGES DES FONCTIONS EXTERNES
$\#plot(x \to g[1, 0](x) + g[2, 0](x), 0..1, numpoints = 20)$:

 # AFFICHAGE DE L'IMAGE OBTENU A PARTIR DES FCTS EXTERNES
$result := Create(taille, \text{taille}, \text{channels} = 1, (x, y) \to newfct(x, y))$:
$Preview(result)$;
Warning, computation interrupted
Error, invalid input: Preview:-Preview expects its 1st argument, img, to be of type ImageTools:-Image, but received result