https://github.com/t-o-k/Maxima-bezier/bezier_basis_functions.wxmx

(%i1)
```
kill(all)$
```

(%i2)
```
load("draw")$
load("bezier")$
```

(%i3)
```
set_draw_defaults(
   xrange = [ 0, 1 ],
   yrange = [ 0, 1 ],
   xlabel = "s",
   ylabel = "",
   grid = true
)$
```

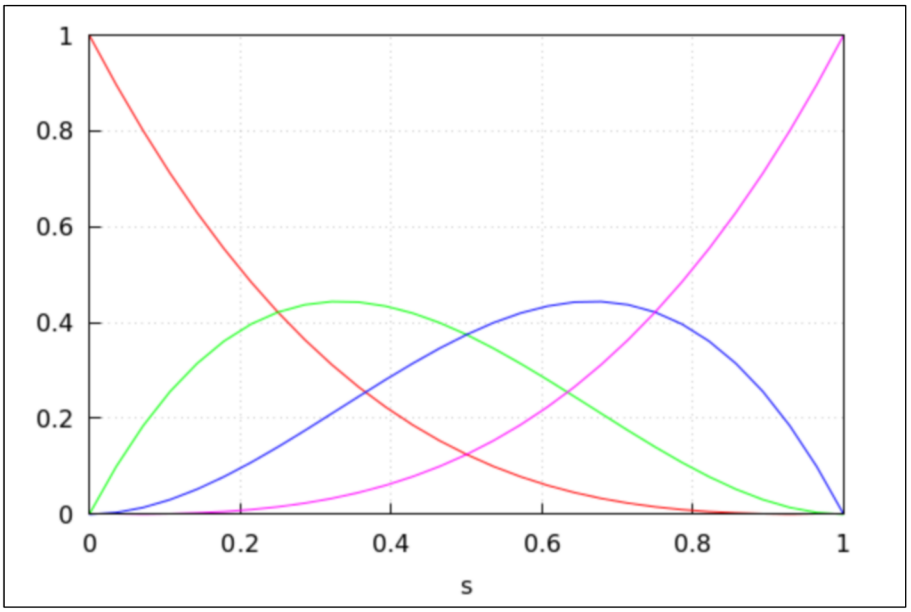
(%i4)
```
degree_s: 3$
```

(%i5)
```
define(bf_1a(s), basis_functions_1a(degree_s, s));
```

(%o5) $$\mathrm{bf\_1a}(s):=\left((1-s)^3 \quad 3(1-s)^2 s \quad 3(1-s)s^2 \quad s^3\right)$$

(%i6)
```
wxdraw2d(
   color = red,
   parametric(s, bf_1a(s)[1, 1], s, 0, 1),
   color = green,
   parametric(s, bf_1a(s)[1, 2], s, 0, 1),
   color = blue,
   parametric(s, bf_1a(s)[1, 3], s, 0, 1),
   color = magenta,
   parametric(s, bf_1a(s)[1, 4], s, 0, 1)
)$
```

(%t6)



(%i7)
```
set_draw_defaults(
   xrange = [ 0, 1 ],
   yrange = [ 0, 1 ],
   zrange = [ 0, 1 ],
   cbrange = [ 0, 1 ],
   colorbox = false,
   xu_grid = 15,
   yv_grid = 15,
   xlabel = "u",
   ylabel = "v",
   zlabel = "",
   grid = true,
   color = gray,
   wired_surface = true,
   surface_hide = false,
   enhanced3d = true,
   view = [ 80, 10 ]
)$
```

(%i9)
```
degree_u: 2$
degree_v: 2$
```

(%i10)
```
define(bf_2a(u, v), basis_functions_2a(degree_u, degree_v, u, v));
```

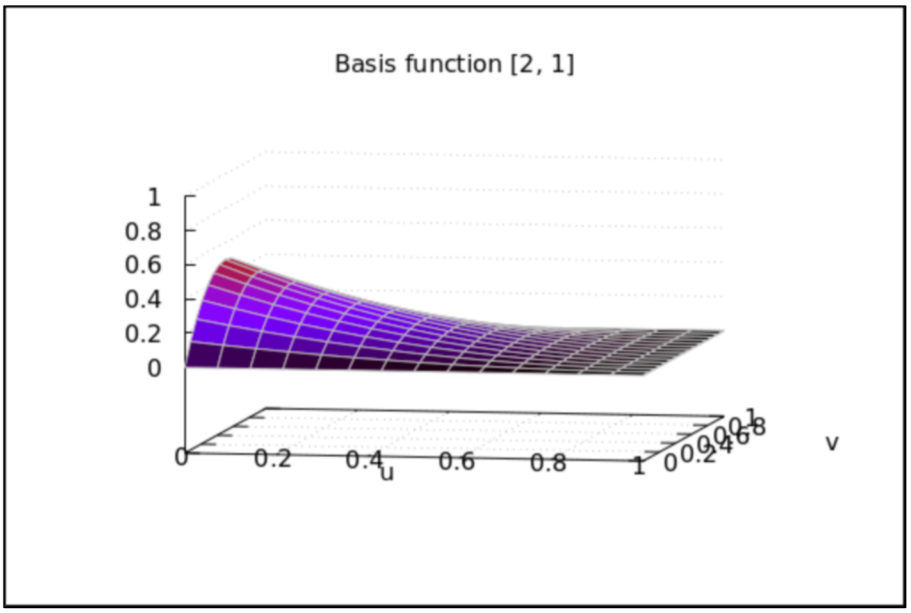
(%o10)
$$\mathrm{bf\_2a}(u,v):=\begin{pmatrix} (1-u)^2\,(1-v)^2 & 2\,(1-u)\,u\,(1-v)^2 & u^2\,(1-v)^2 \\ 2\,(1-u)^2\,(1-v)\,v & 4\,(1-u)\,u\,(1-v)\,v & 2\,u^2\,(1-v)\,v \\ (1-u)^2\,v^2 & 2\,(1-u)\,u\,v^2 & u^2\,v^2 \end{pmatrix}$$

(%i11)
```
bf_2a(u, v)[2, 1];
```

(%o11)
$$2\,(1-u)^2\,(1-v)\,v$$

(%i12)
```
wxdraw3d(
    title = "Basis function [2, 1]",
    parametric_surface(
        u,
        v,
        bf_2a(u, v)[2, 1],
        u, 0, 1,
        v, 0, 1
    )
)$
```

(%t12)

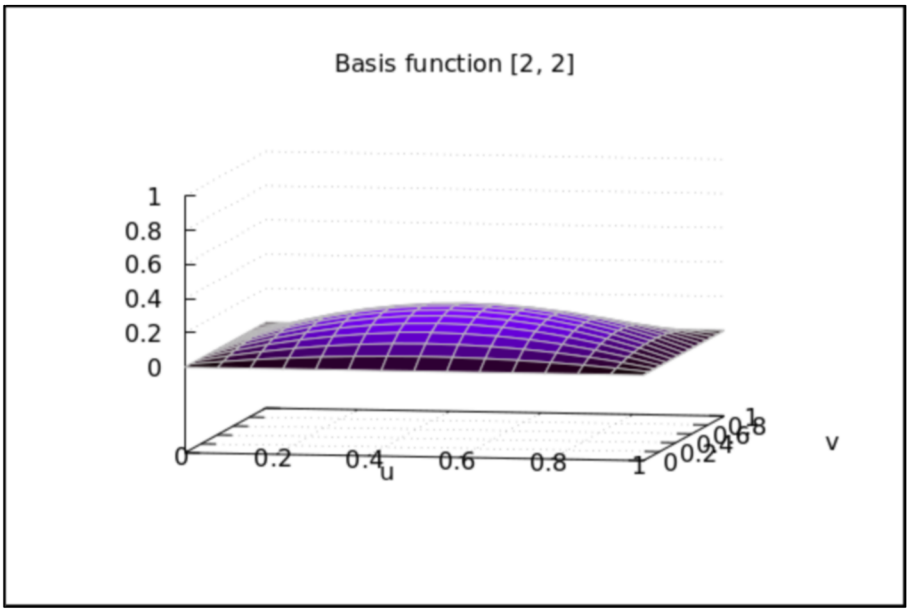


(%i13)
```
bf_2a(u, v)[2, 2];
```

(%o13)
$$4\,(1-u)\,u\,(1-v)\,v$$

```
(%i14) wxdraw3d(
         title = "Basis function [2, 2]",
         parametric_surface(
           u,
           v,
           bf_2a(u, v)[2, 2],
           u, 0, 1,
           v, 0, 1
         )
       )$
```

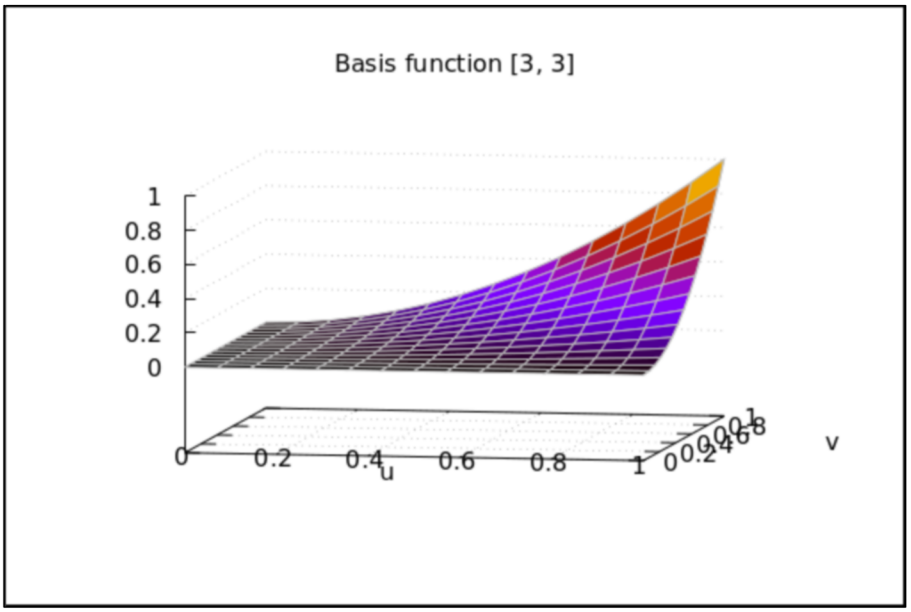
(%t14)




```
(%i15) bf_2a(u, v)[3, 3];
                                2  2
(%o15)                         u  v
```

```
(%i16) wxdraw3d(
         title = "Basis function [3, 3]",
         parametric_surface(
           u,
           v,
           bf_2a(u, v)[3, 3],
           u, 0, 1,
           v, 0, 1
         )
       );
```

(%t16)



(%o16)