

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

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```
(%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) bf_1a(s) :=  $\begin{pmatrix} (1-s)^3 & 3(1-s)^2s & 3(1-s)s^2 & s^3 \end{pmatrix}$ 

(%i6) wdraw2d(
  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)
)$
```

```
(%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 = "",
    color = blue,
    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));

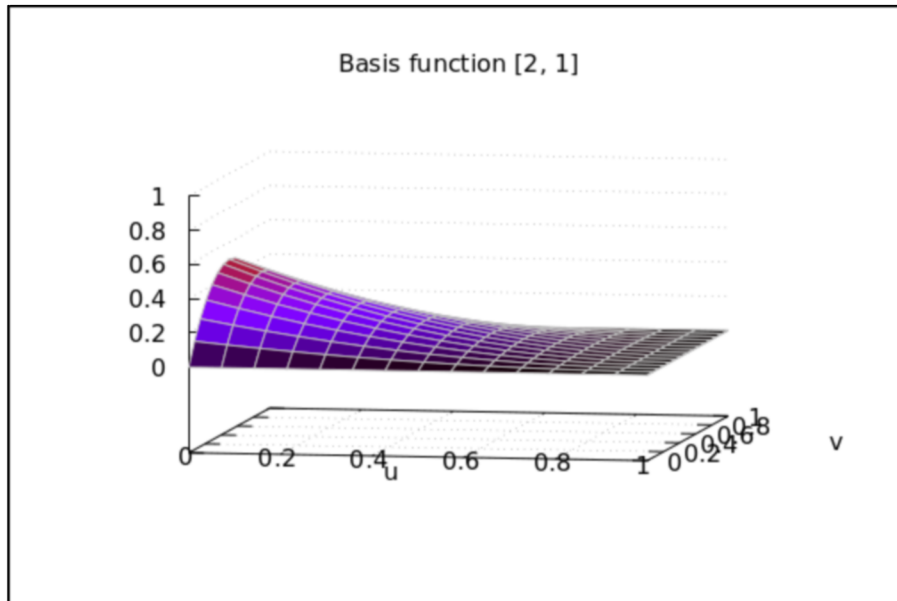
(%o10) bf_2a(u, v) :=

$$\begin{pmatrix} (1-u)^2 (1-v)^2 & 2 (1-u) u (1-v)^2 & u^2 (1-v)^2 \\ 2 (1-u)^2 (1-v) v & 4 (1-u) u (1-v) v & 2 u^2 (1-v) v \\ (1-u)^2 v^2 & 2 (1-u) u v^2 & u^2 v^2 \end{pmatrix}$$


(%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
    )
)$
```

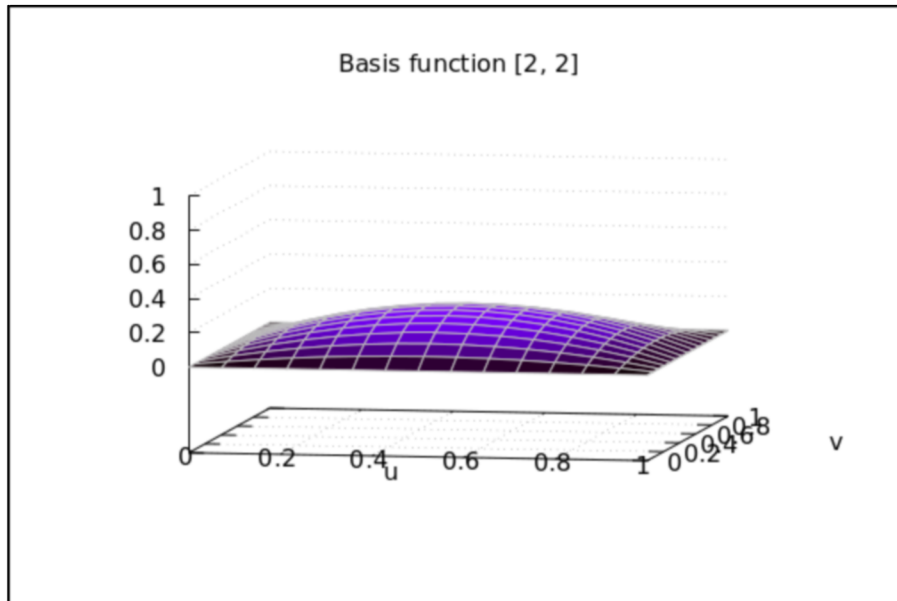
(%t12)



```
(%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)



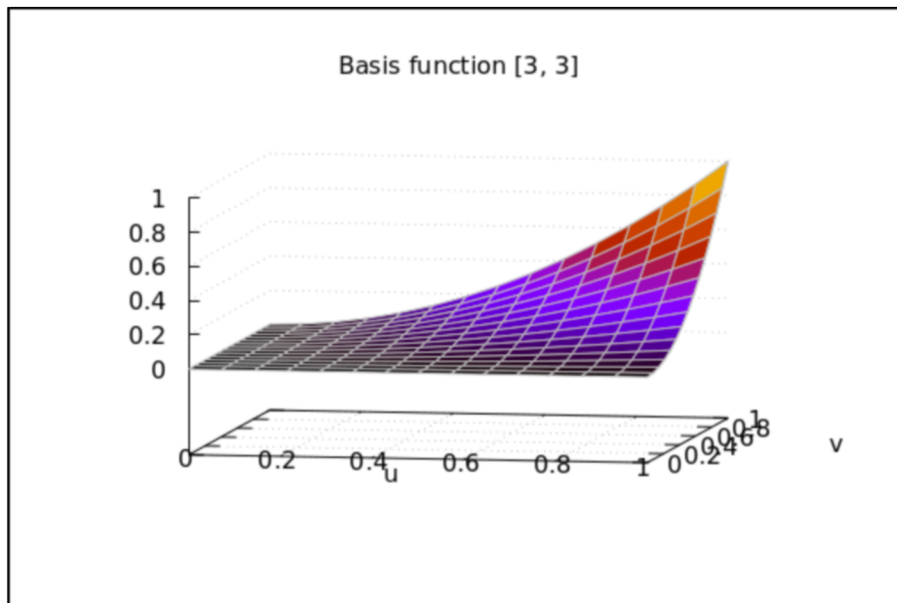
```
(%i15) bf_2a(u, v)[3, 3];
```

```
(%o15) 
$$u^2 v^2$$

```

```
(%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)