

https://github.com/t-o-k/Maxima-bezier/cylinder_made_with_4_rational_bezier_surfaces_3d.wmx

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

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

```
(%i3) tau: 2*%pi$
```

```
(%i4) no_of_sections: 4$
```

```
(%i5) angle: tau/no_of_sections/2;
```

```
(angle)  $\frac{\pi}{4}$ 
```

```
(%i6) ww: transpose(matrix([ 1, 1, 1 ]))$
```

```
(%i7) weights: ww.matrix([ 1, cos(angle), 1 ]);
```

```
(weights) 
$$\begin{pmatrix} 1 & \frac{1}{\sqrt{2}} & 1 \\ 1 & \frac{1}{\sqrt{2}} & 1 \\ 1 & \frac{1}{\sqrt{2}} & 1 \end{pmatrix}$$

```

```
(%i8) rr: transpose(matrix([ r_1, r_2, r_3 ]))$
```

```
(%i10) points1_x: rr.matrix(r_a*[ 0, 1, 1 ])$
points1_y: rr.matrix(r_b*[ -1, -1, 0 ])$
```

```
(%i12) points2_x: rr.matrix(r_a*[ 1, 1, 0 ])$
points2_y: rr.matrix(r_b*[ 0, 1, 1 ])$
```

```
(%i14) points3_x: rr.matrix(r_a*[ 0, -1, -1 ])$
points3_y: rr.matrix(r_b*[ 1, 1, 0 ])$
```

```
(%i16) points4_x: rr.matrix(r_a*[ -1, -1, 0 ])$
points4_y: rr.matrix(r_b*[ 0, -1, -1 ])$
```

```
(%i17) hh: transpose(matrix(h*[ -1, 0, 1 ]/2));
```

```
(hh) 
$$\begin{pmatrix} -\frac{h}{2} \\ 0 \\ \frac{h}{2} \end{pmatrix}$$

```

```
(%i18) points_z: hh.matrix([ 1, 1, 1 ])$
```

```
(%i20) define(f1_x(u, v), rational_bezier_function_2a(points1_x, weights, u, v))$
define(f1_y(u, v), rational_bezier_function_2a(points1_y, weights, u, v))$
```

```
(%i22) define(f2_x(u, v), rational_bezier_function_2a(points2_x, weights, u, v))$
define(f2_y(u, v), rational_bezier_function_2a(points2_y, weights, u, v))$
```

```
(%i24) define(f3_x(u, v), rational_bezier_function_2a(points3_x, weights, u, v))$
define(f3_y(u, v), rational_bezier_function_2a(points3_y, weights, u, v))$
```

```
(%i26) define(f4_x(u, v), rational_bezier_function_2a(points4_x, weights, u, v))$
define(f4_y(u, v), rational_bezier_function_2a(points4_y, weights, u, v))$
```

```
(%i27) define(f_z(u, v), rational_bezier_function_2a(points_z, weights, u, v))$

(%i31) s1: parametric_surface(f1_x(u, v), f1_y(u, v), f_z(u, v), u, u0, u1, v, v0, v1)$
      s2: parametric_surface(f2_x(u, v), f2_y(u, v), f_z(u, v), u, u0, u1, v, v0, v1)$
      s3: parametric_surface(f3_x(u, v), f3_y(u, v), f_z(u, v), u, u0, u1, v, v0, v1)$
      s4: parametric_surface(f4_x(u, v), f4_y(u, v), f_z(u, v), u, u0, u1, v, v0, v1)$

(%i32) h: 1.5$

(%i34) r_a: 1$
      r_b: 1$

(%i37) r_1: 1$
      r_2: 1$
      r_3: 1$

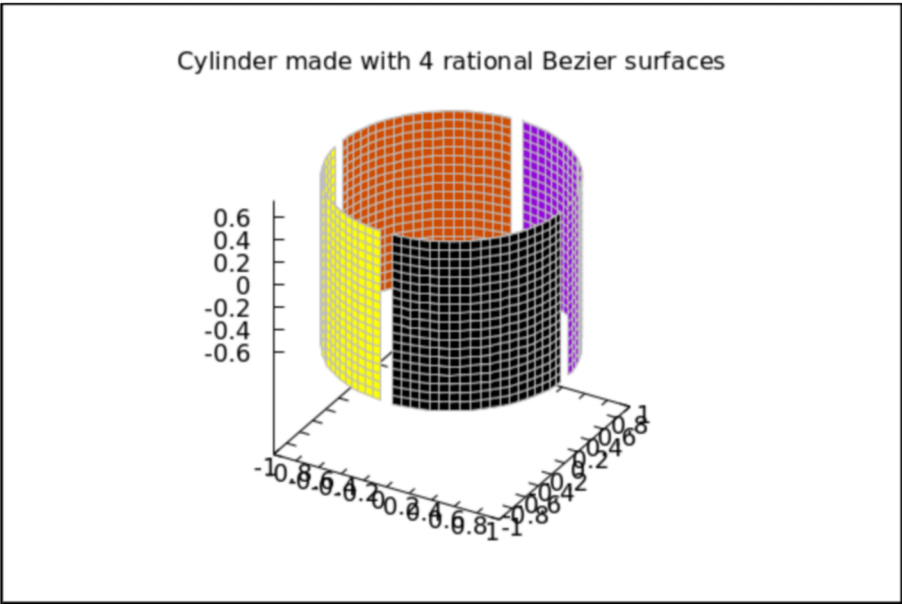
(%i39) u0: 0$
      u1: 1$

(%i41) v0: 0$
      v1: 1$

(%i43) u0: u0 + 0.04;
      u1: u1 - 0.04;
(u0) 0.04
(u1) 0.96

(%i44) wxdraw3d(
  title = "Cylinder made with 4 rational Bezier surfaces",
  proportional_axes = xyz,
  colorbox = false,
  xu_grid = 20,
  yv_grid = 20,
  view = [ 60, 30 ],
  wired_surface = true,
  color = gray,
  enhanced3d = [ -6/3, x, y, z ],
  "s1,
  enhanced3d = [ -2/3, x, y, z ],
  "s2,
  enhanced3d = [ +2/3, x, y, z ],
  "s3,
  enhanced3d = [ +6/3, x, y, z ],
  "s4
);
```

(%t44)



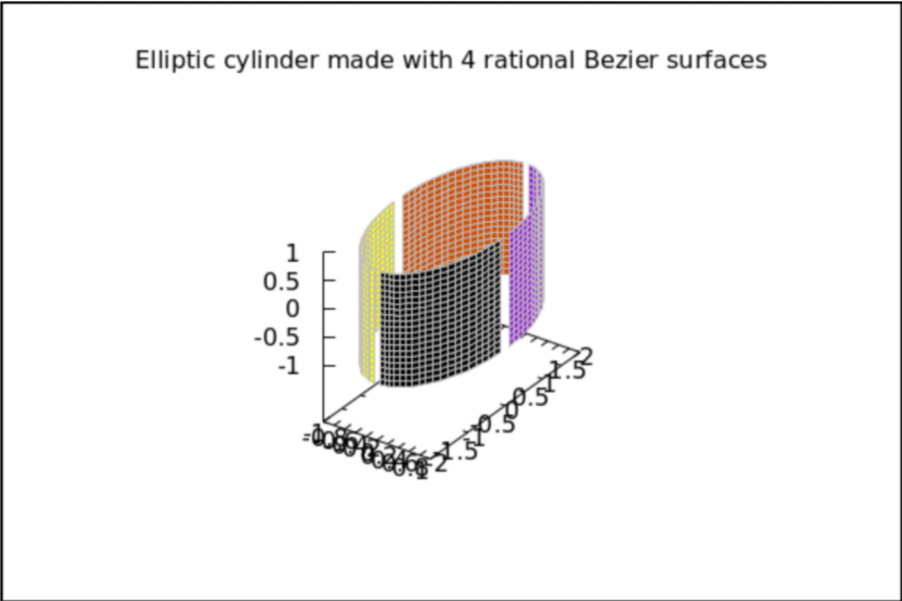
(%o44)

```
(%i45) h: 2$

(%i47) r_a: 1$
      r_b: 2$
```

```
(%i48) wxdraw3d(  
  title = "Elliptic cylinder made with 4 rational Bezier surfaces",  
  proportional_axes = xyz,  
  colorbox = false,  
  xu_grid = 20,  
  yv_grid = 20,  
  view = [ 60, 35 ],  
  wired_surface = true,  
  color = gray,  
  enhanced3d = [ -6/3, x, y, z ],  
  "s1,  
  enhanced3d = [ -2/3, x, y, z ],  
  "s2,  
  enhanced3d = [ +2/3, x, y, z ],  
  "s3,  
  enhanced3d = [ +6/3, x, y, z ],  
  "s4  
);
```

(%t48)

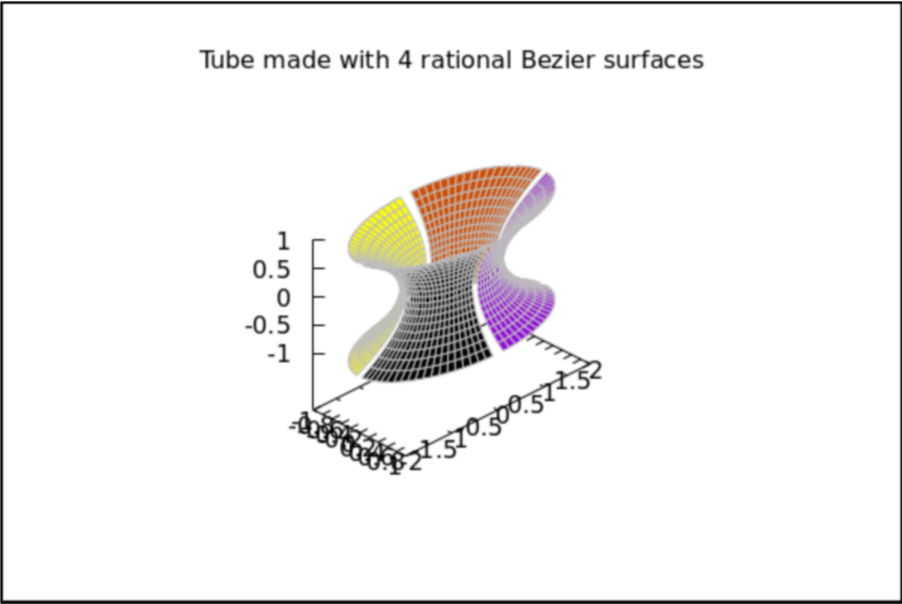


(%o48)

```
(%i51) r_1: 1$  
      r_2: 0$  
      r_3: 1$
```

```
(%i52) wxdraw3d(  
  title = "Tube made with 4 rational Bezier surfaces",  
  proportional_axes = xyz,  
  colorbox = false,  
  xu_grid = 20,  
  yv_grid = 20,  
  view = [ 60, 45 ],  
  wired_surface = true,  
  color = gray,  
  enhanced3d = [ -6/3, x, y, z ],  
  "s1,  
  enhanced3d = [ -2/3, x, y, z ],  
  "s2,  
  enhanced3d = [ +2/3, x, y, z ],  
  "s3,  
  enhanced3d = [ +6/3, x, y, z ],  
  "s4  
);
```

(%t52)



(%o52)