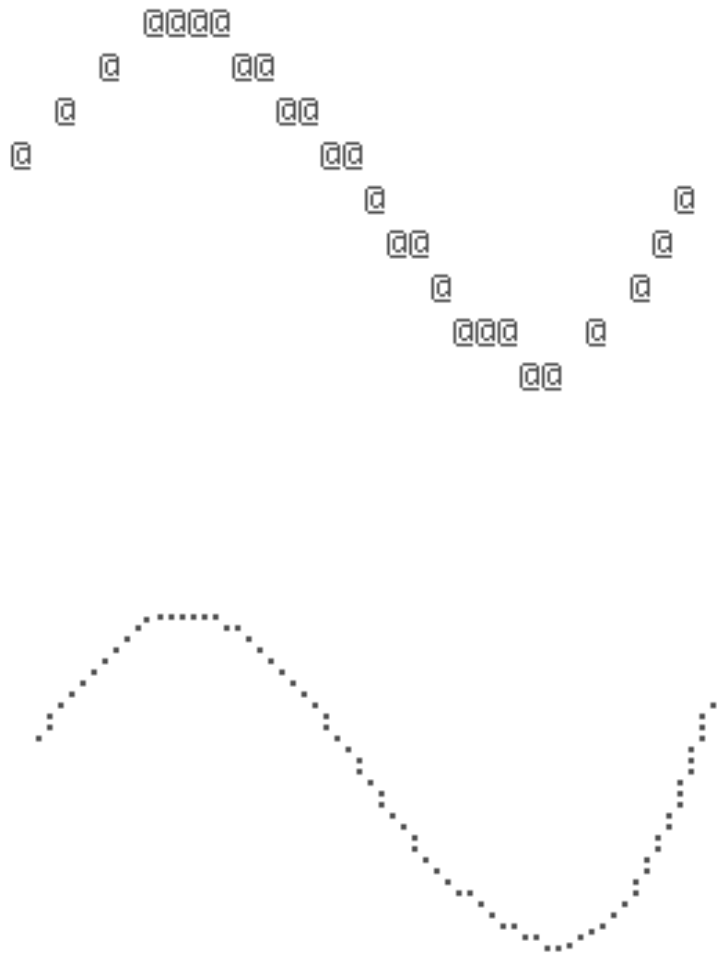
Weiche Kurven in der Computergrafik

Alexander Heinrich

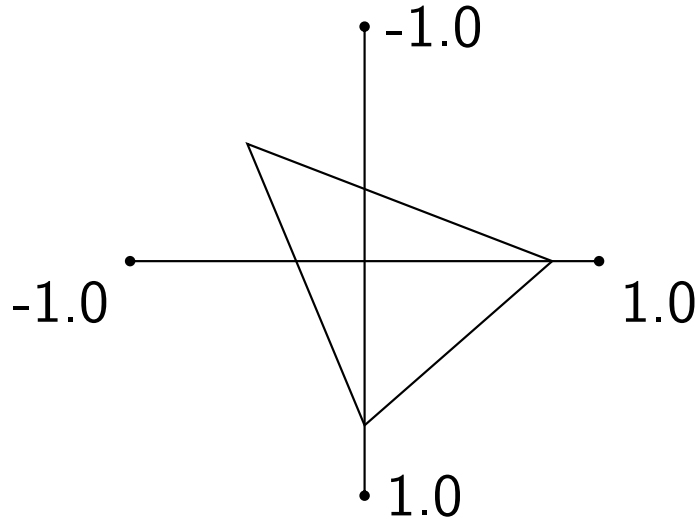
29.08.17

Zeichnen in Konsole

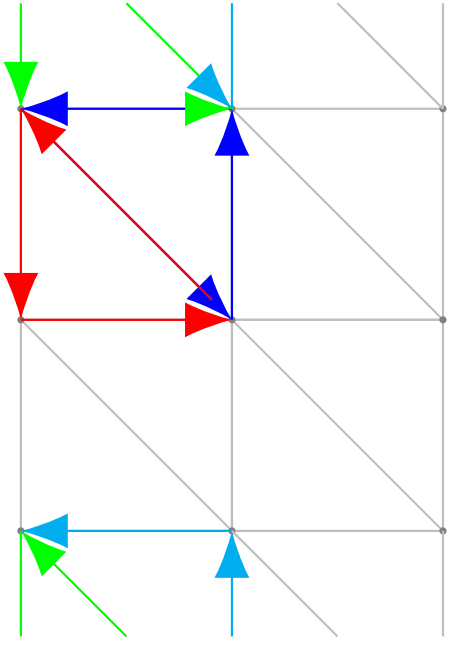


Darstellung eines Dreiecks

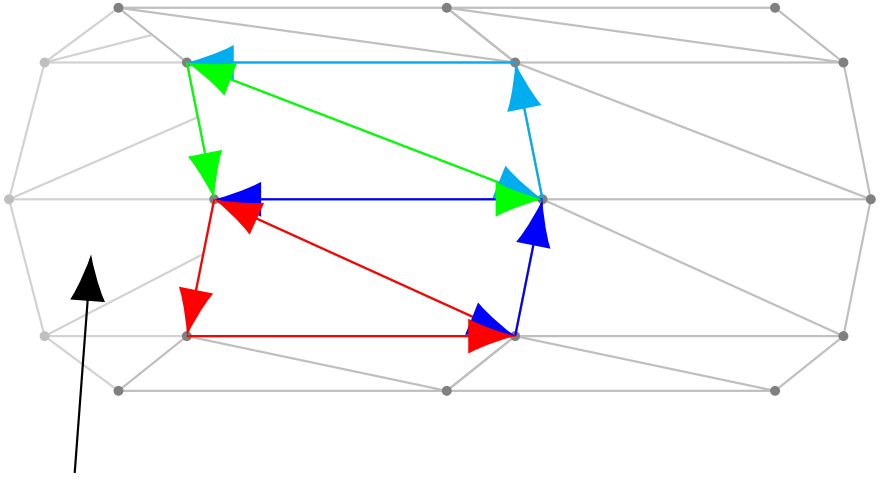
```
Float[] triangle =
[
  -0.5,  0.5, 0.0,
   0.8,  0.0, 0.0,
   0.0, -0.7, 0.0,
]
```



Generierung eines Zylinders

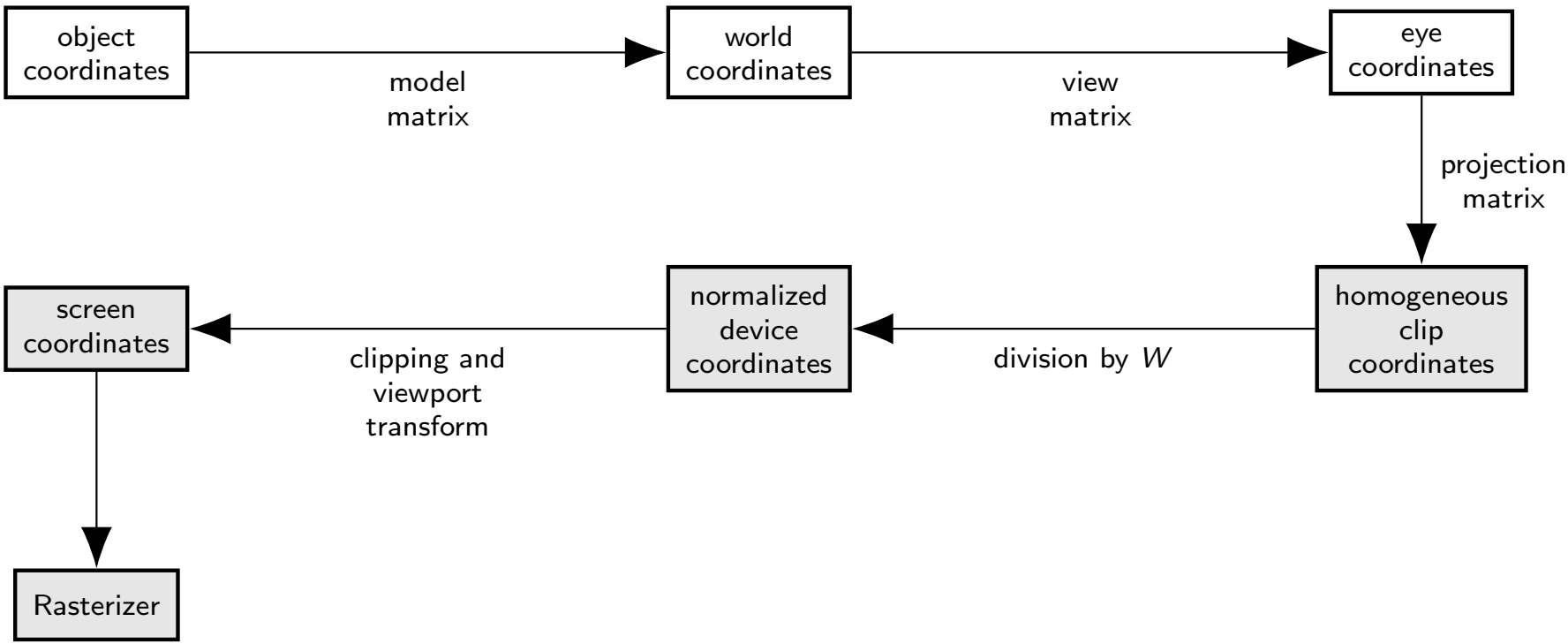


Counter-clockwise winding order

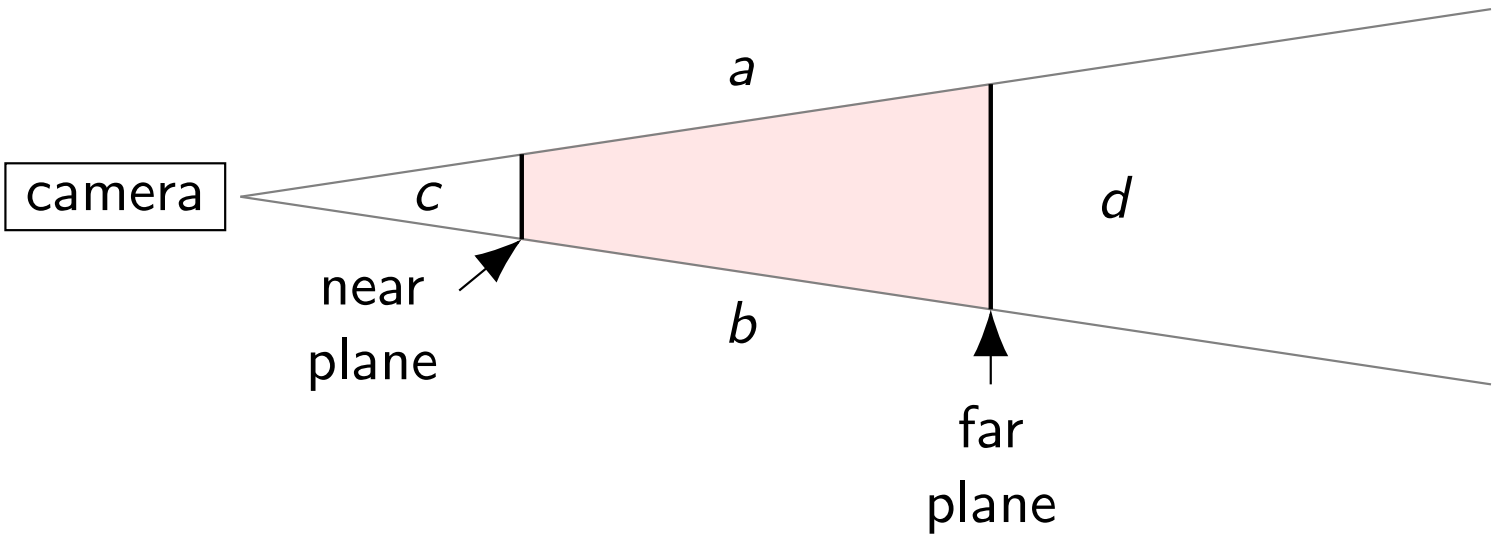


Triangle faces away from camera

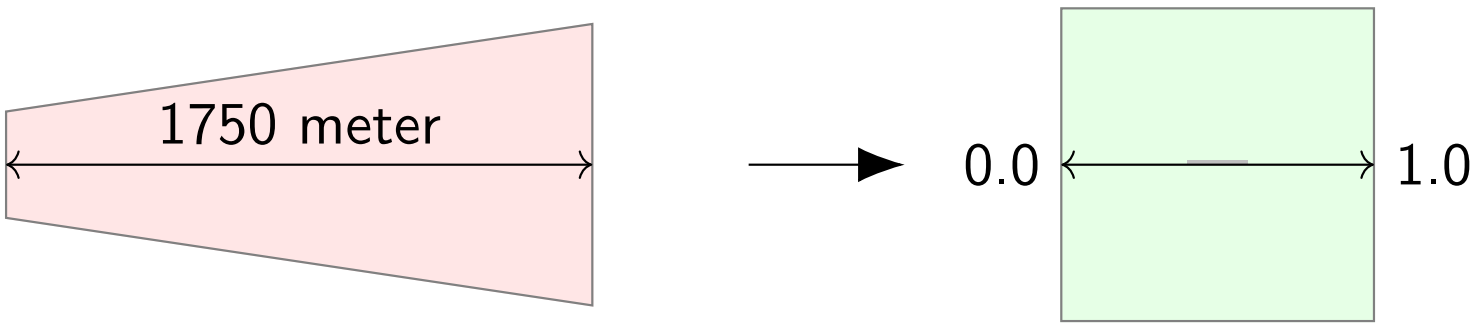
Moderne Rendering Pipeline



Perspektive



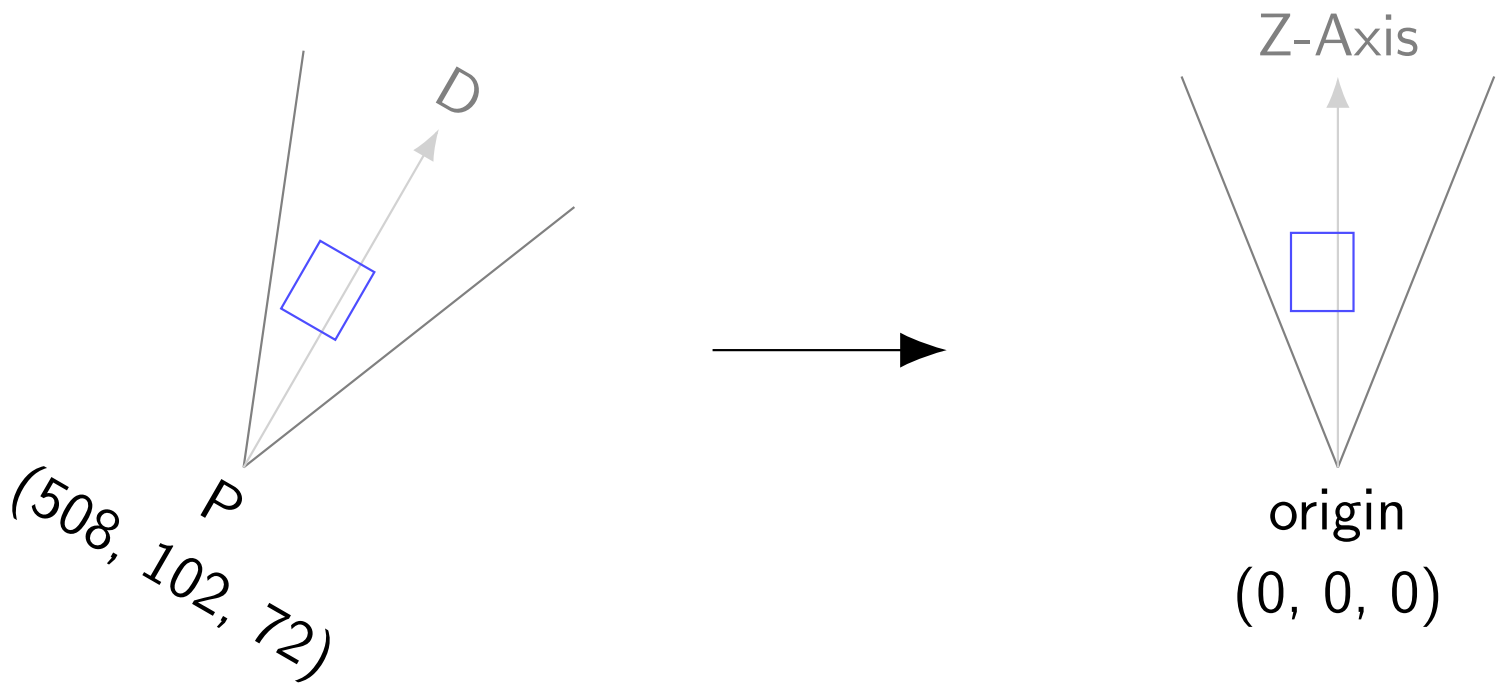
Projektion nach homogene Clip-Koordinaten



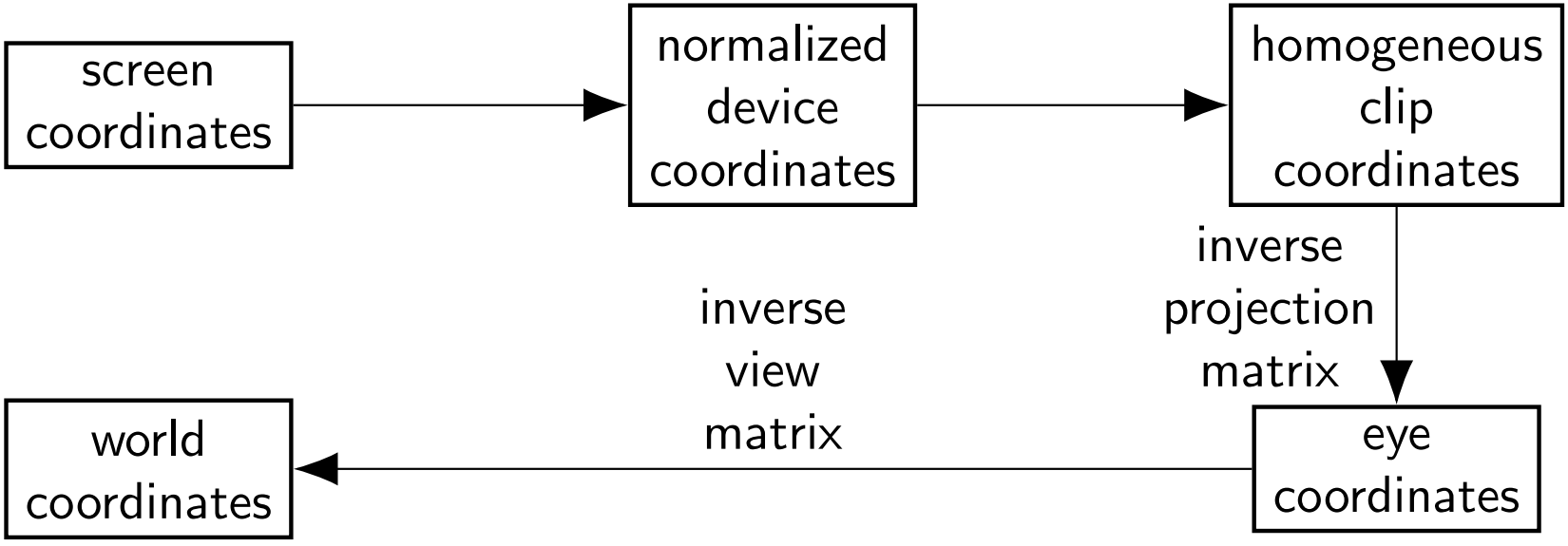
Projektionsmatrix

$$\begin{pmatrix} \frac{Znear}{width/2} & 0 & 0 & 0 \\ 0 & \frac{Znear}{height/2} & 0 & 0 \\ 0 & 0 & -\frac{Zfar+Znear}{Zfar-Znear} & \frac{2ZfarZnear}{Zfar-Znear} \\ 0 & 0 & -1 & 0 \end{pmatrix}$$

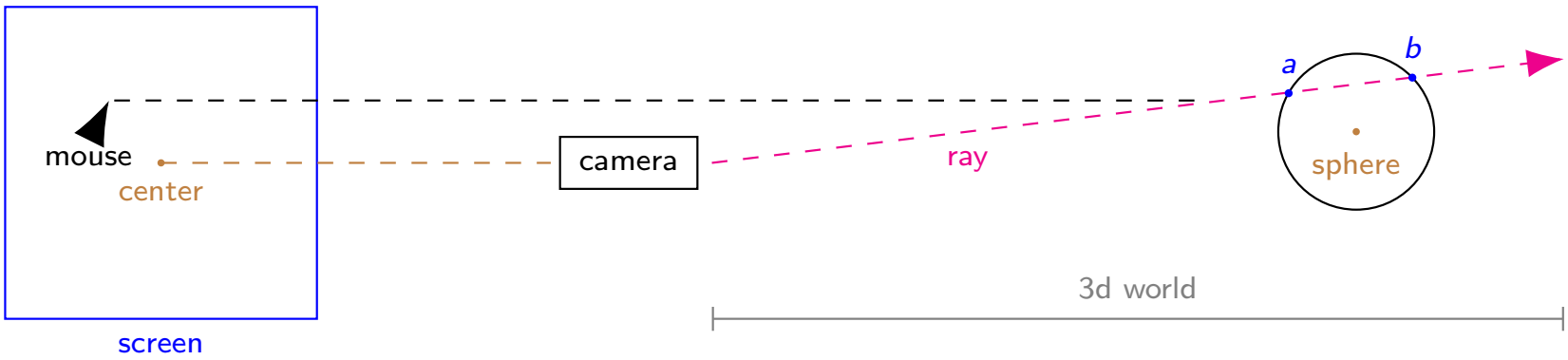
Effekt der View-Matrix



Umgekehrte Rendering Pipeline



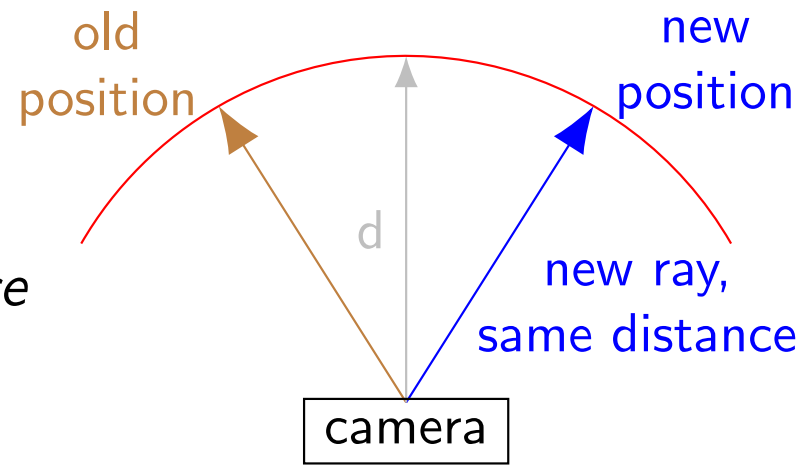
Kollision von Lichtstrahl mit Kugel



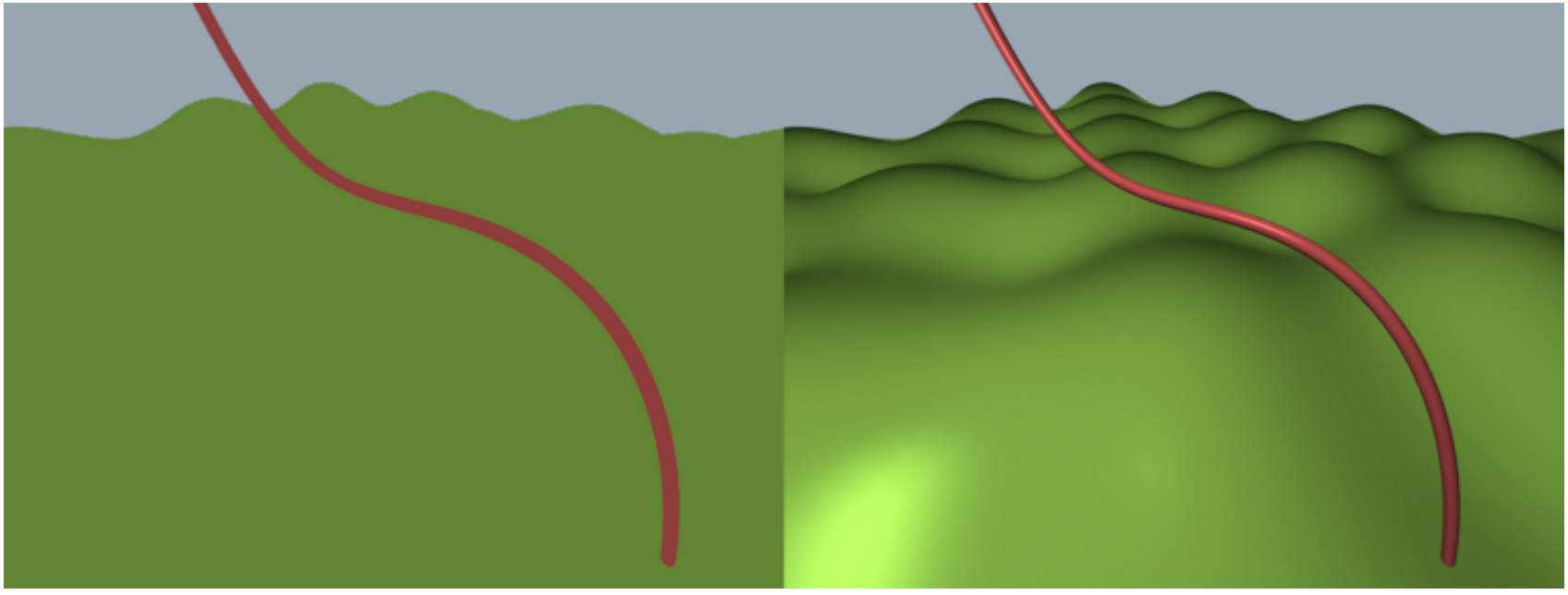
Verschiebung der Kugel

$$distance = sphere - camera$$

$$position = camera + ray \times distance$$



Beleuchtung



Multiplikation von Farben

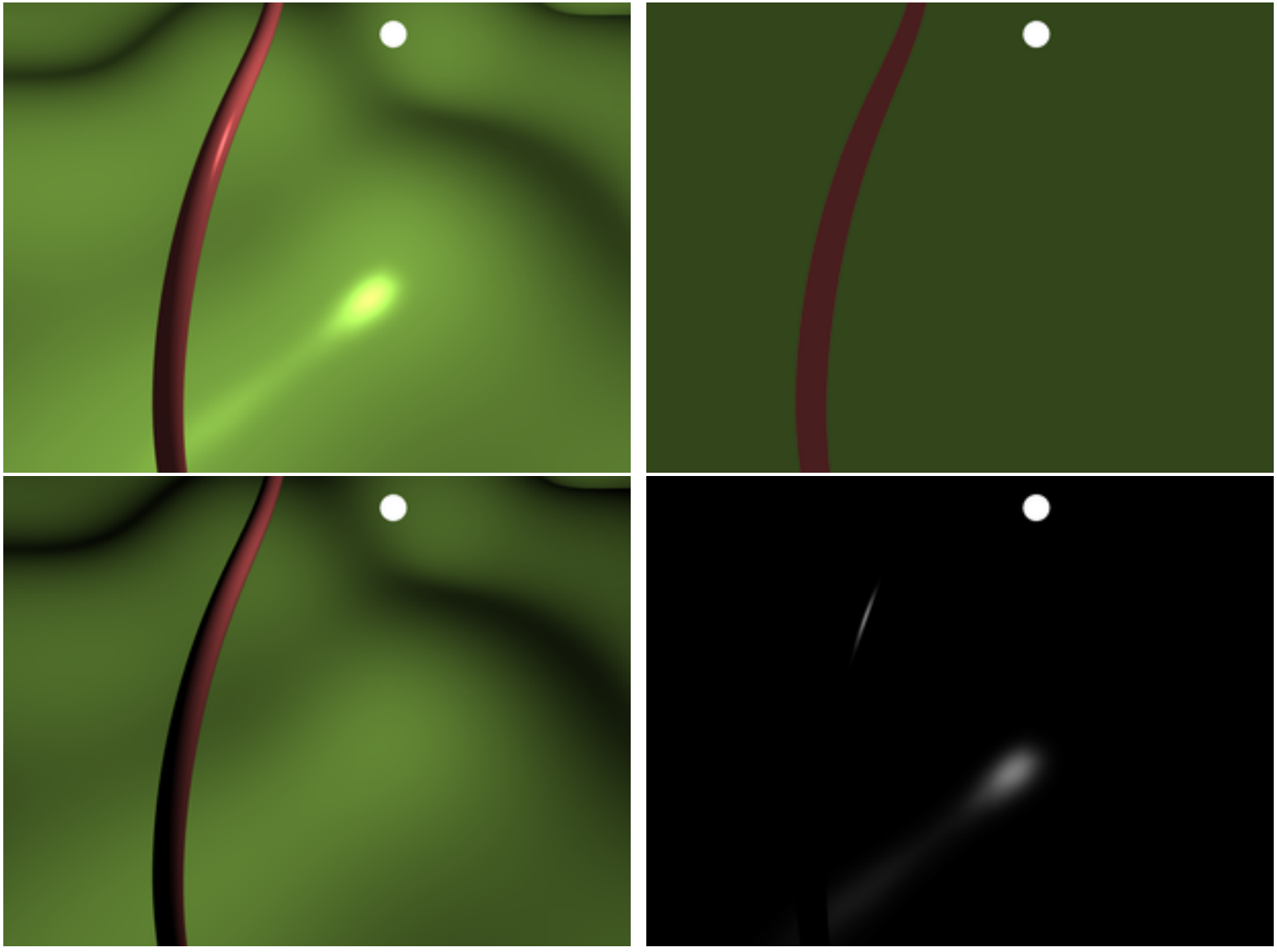
Beispiel für grünes Objekt mit weißem Licht:

$$[0.5, 0.75, 0.0] \times [1.0, 1.0, 1.0] = [0.5, 0.75, 0.0]$$

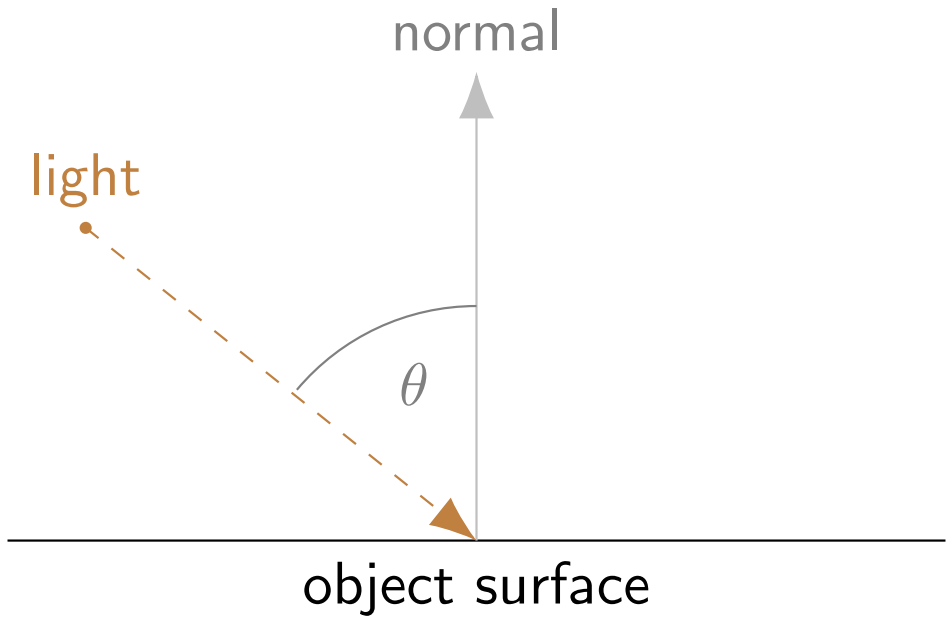
Beispiel für grünes Objekt mit rötlichem Licht:

$$[0.5, 0.75, 0.0] \times [1.0, 0.7, 0.7] = [0.5, 0.525, 0.0]$$

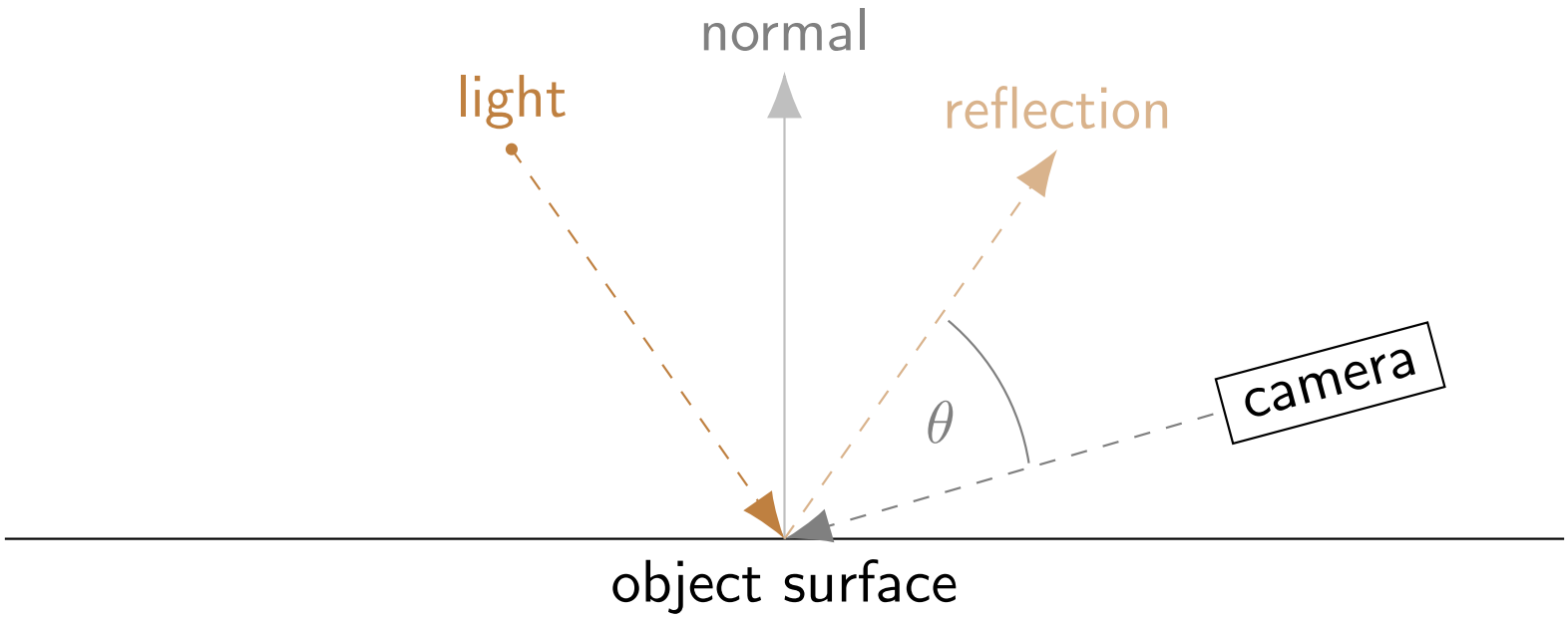
Phong Shading



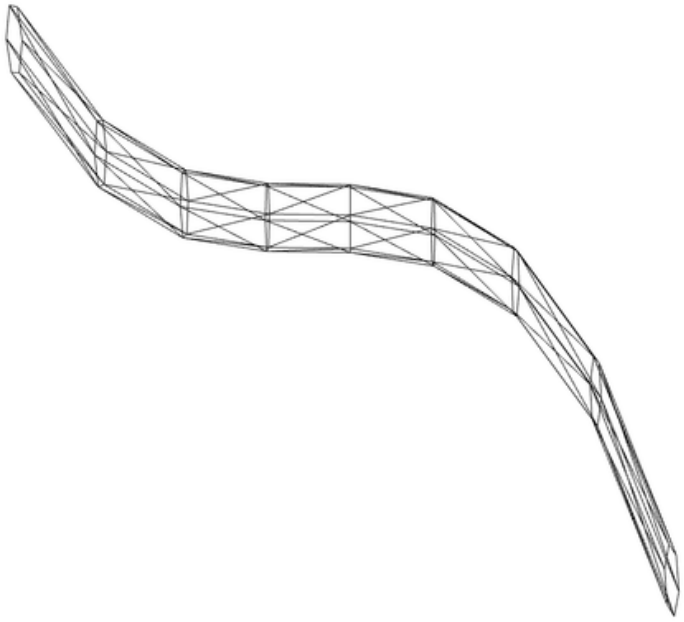
Diffuses Licht

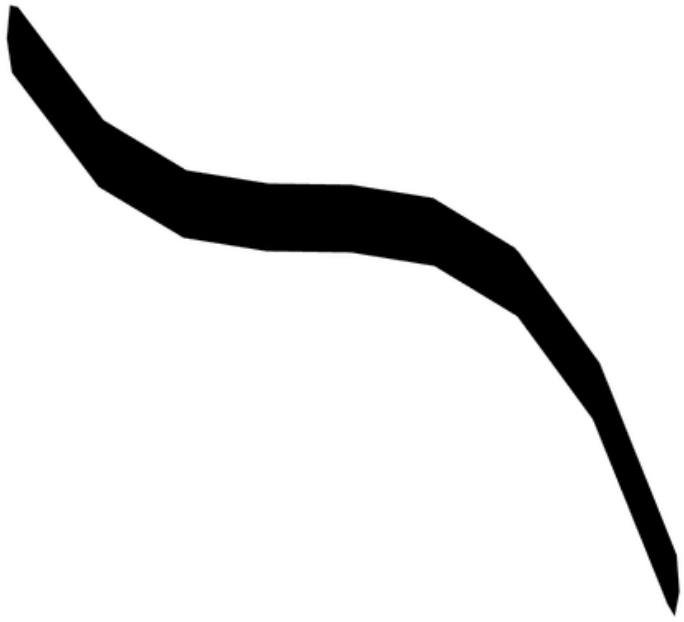


Spekularität

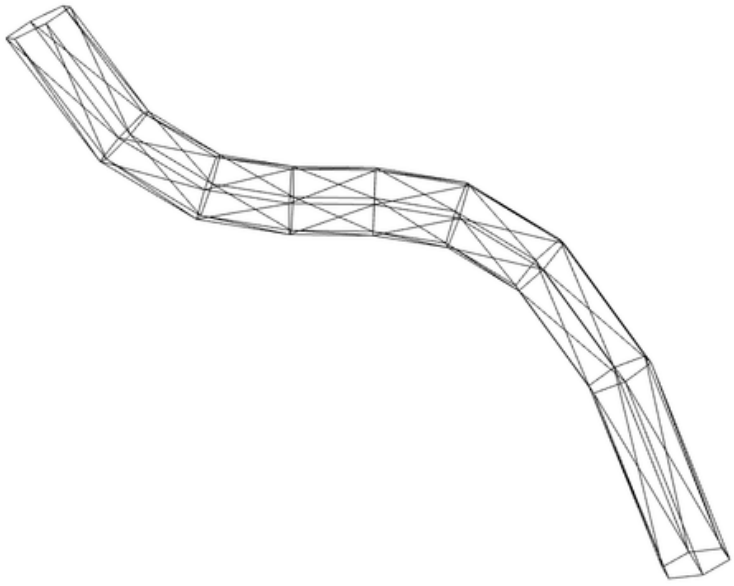


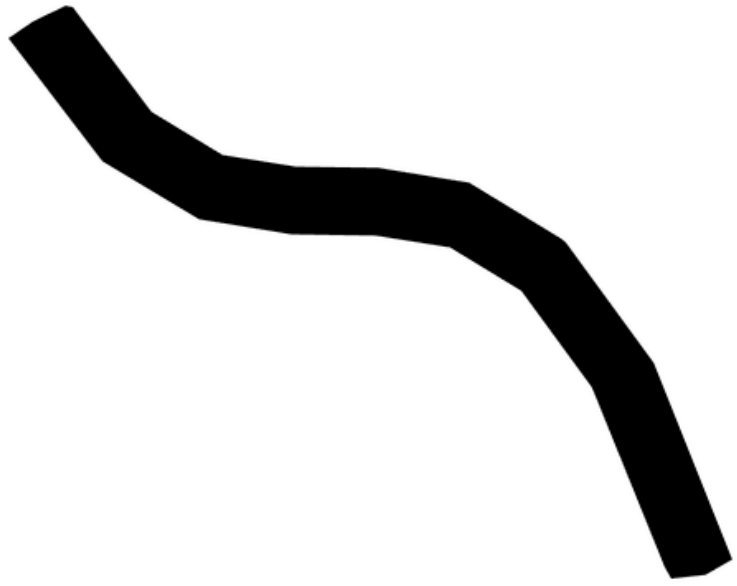
x^3 visualisiert



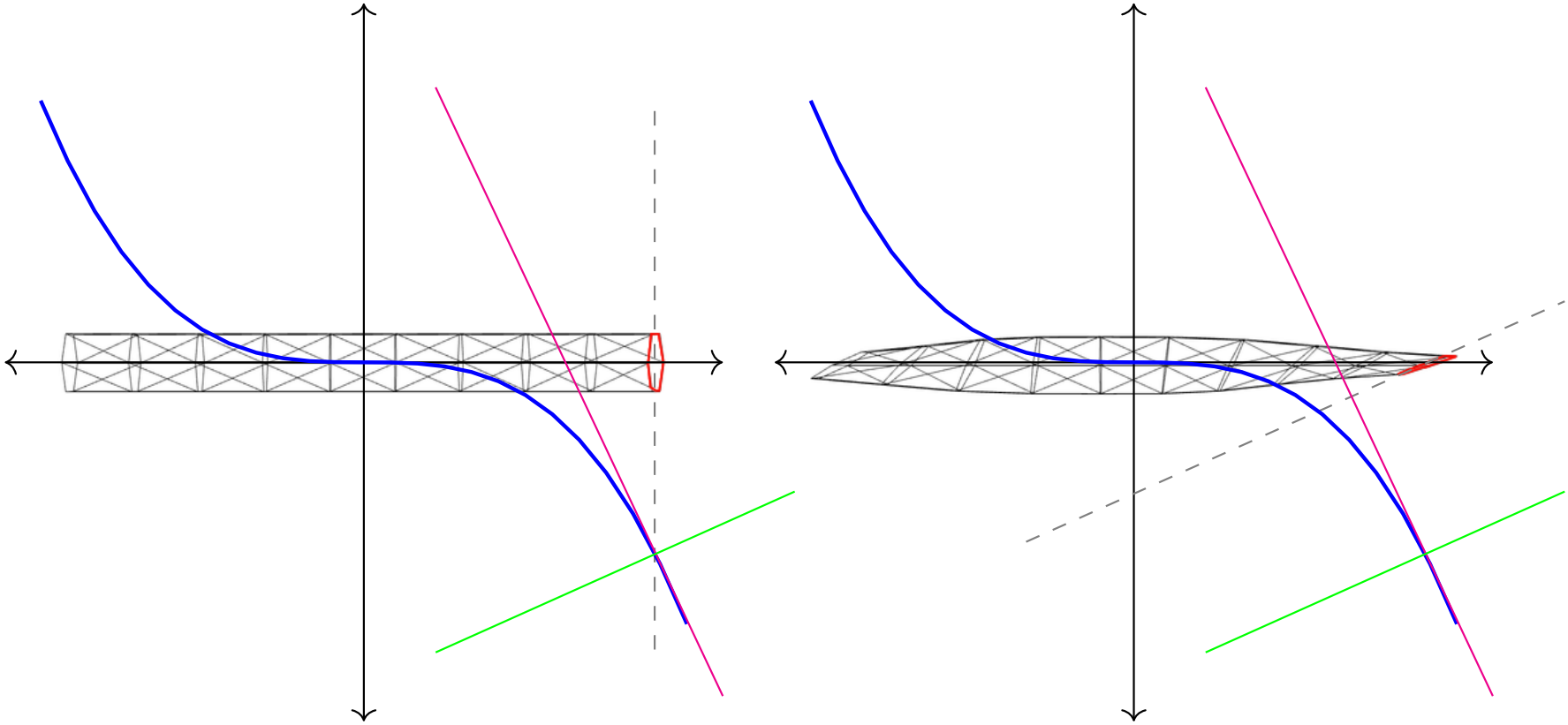


x^3 visualisiert

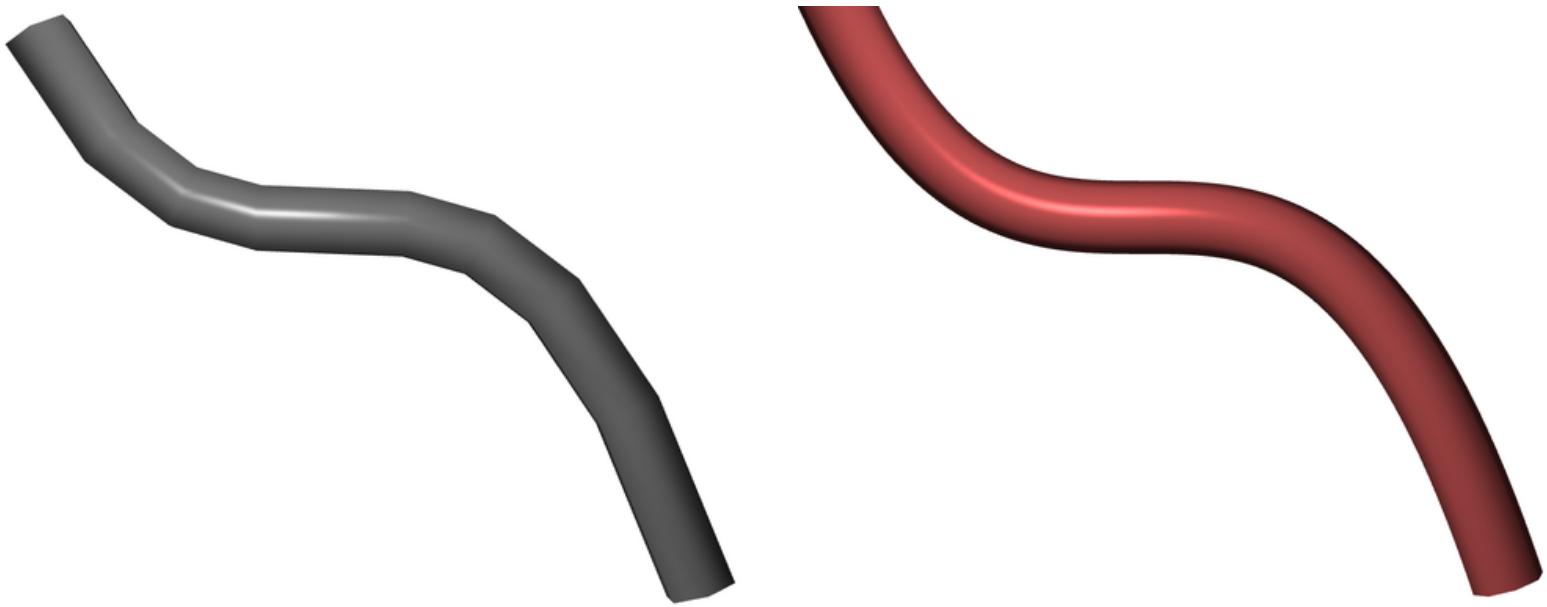




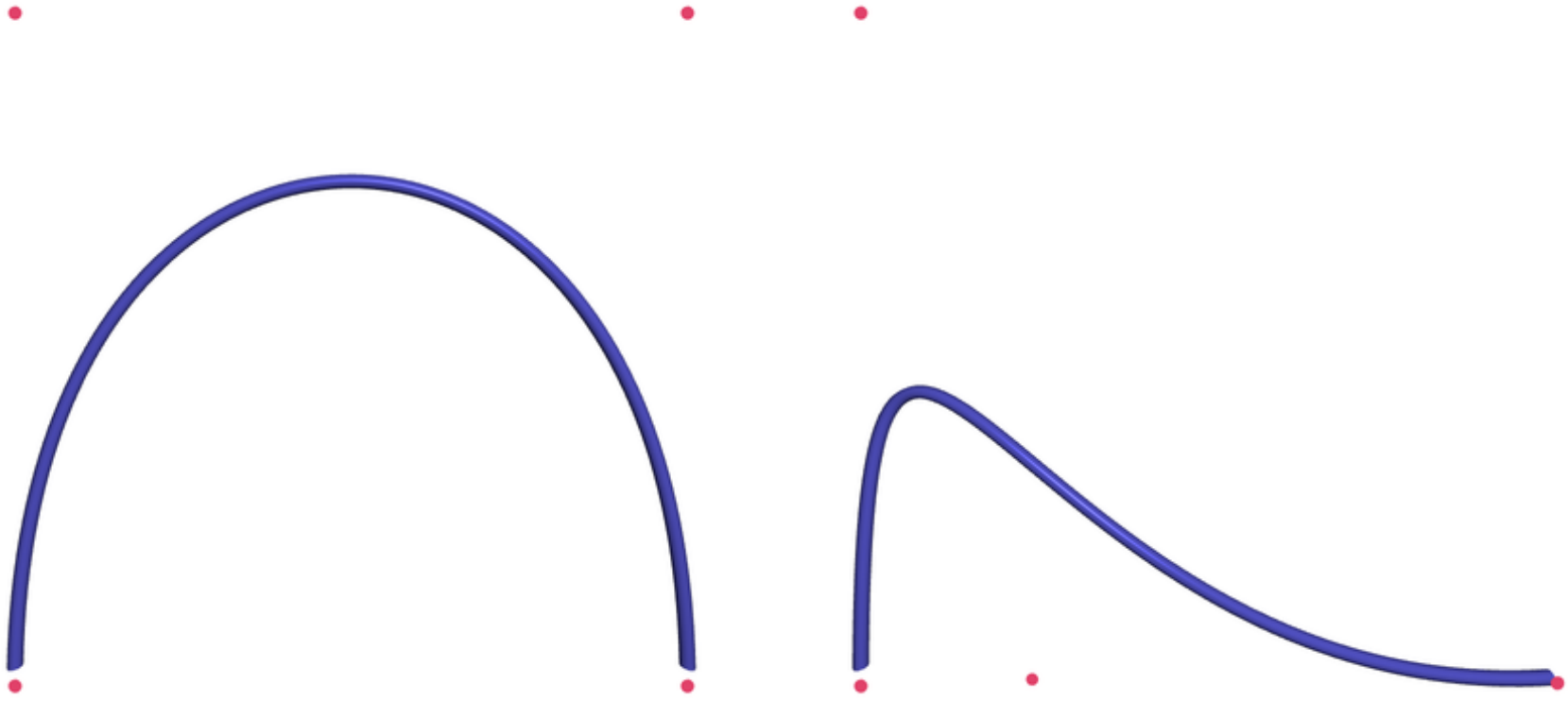
Rotation um Mittelpunkt



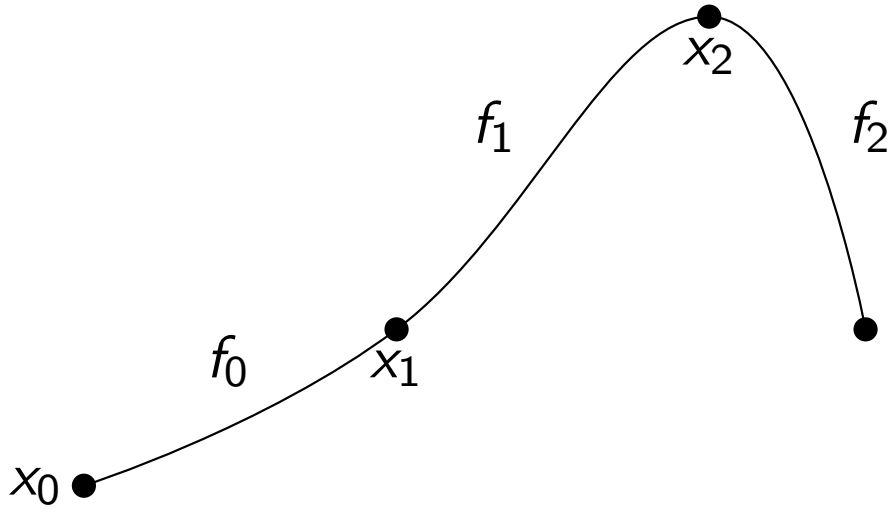
Kurven mit Beleuchtung durch Normalen



Bézier-Kurve



Kubische Spline



Spline Kurven