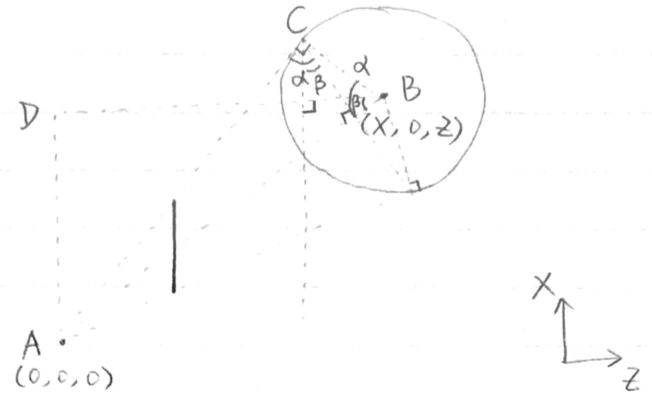
2)



The points on the sphere that relates to the edge of the silhouette form a cone with the origin (0, 0, 0), as shown above

we know that a proper cut on the cone can be an ellipse, with eccentricity calculated by

$$e = \frac{\sin\beta}{\sin\alpha}$$

α and β are defined above in the figure

A, B, C, D are points also defined above

$$\sin\alpha = \frac{AC}{AB} = \frac{\sqrt{x^2+z^2-r^2}}{\sqrt{x^2+z^2}}$$

$$\sin\beta = \frac{AD}{AB} = \frac{X}{\sqrt{x^2+z^2}}$$

then $e = \frac{\sin\beta}{\sin\alpha} = \frac{X}{\sqrt{x^2+z^2-r^2}}$ when $z > r$, ellipse

when $z = r$ or $X \gg z, r$

$e \to 1$ then it will look like a parabola

when $z < r$, $e > 1$, then it will look like a hyperbola.