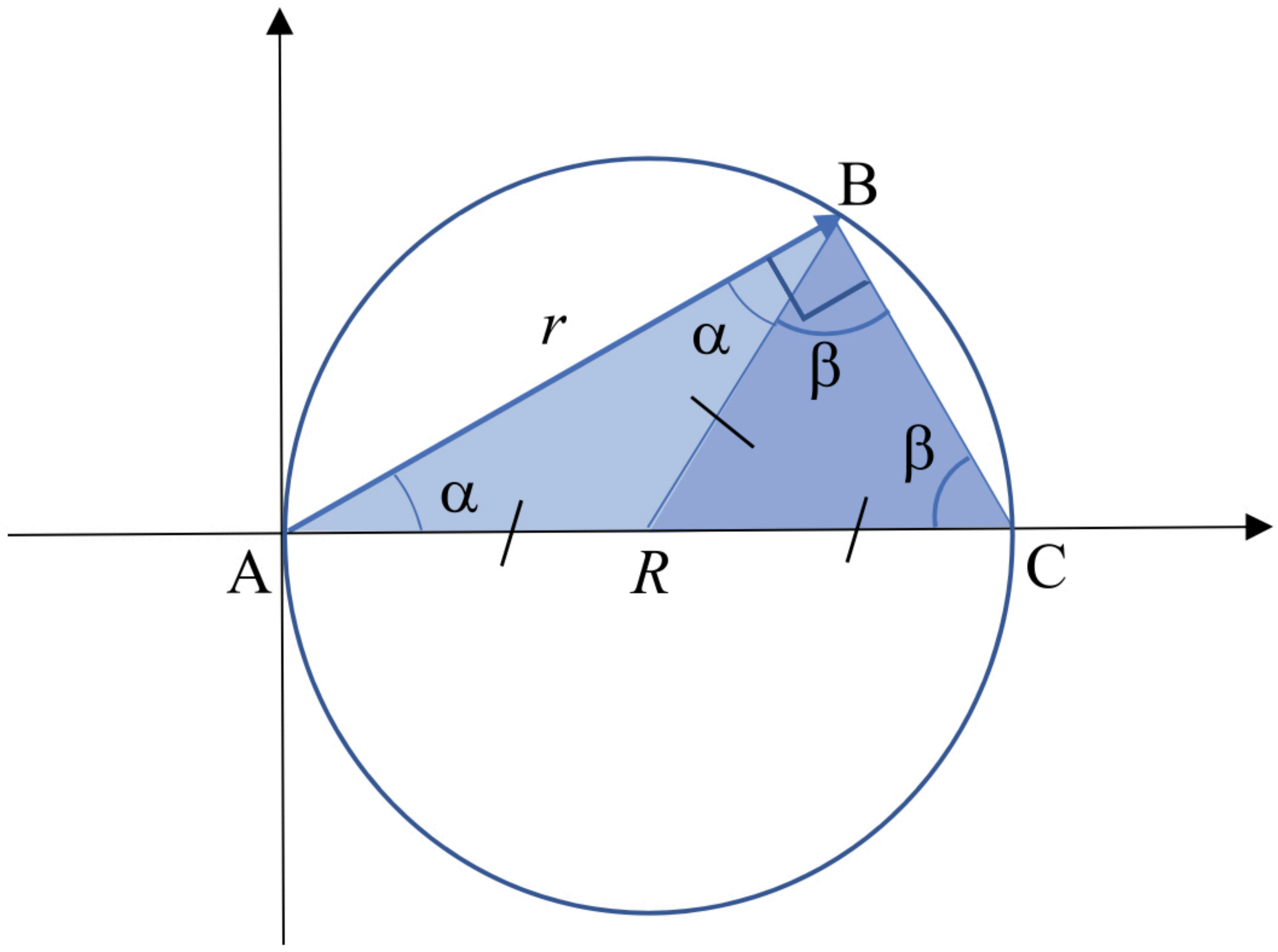

Fig. 1.10 A circle with the center at $(R, 0)$

The polar definition of a circle will become very different if its center is located at the Cartesian coordinates $(R, 0)$ (Fig. 1.10).

You may know that the triangle ABC, inscribed into the circle so that its longer side is its diameter, is a right triangle. One simple proof to it is to split this triangle into two isosceles triangles (having two sides of equal length) ABR and BCR. Two of their sides are equal to the radius of the circle, and the respective angles α and β are equal. Then, since the sum of the angles of any triangle is 180°, we can write

~~$\alpha + (\alpha + \beta) + \alpha = 180^\circ$ which yields $2(\alpha + \beta) = 180^\circ$ or $\alpha + \beta = 90^\circ$~~

$$\alpha + (\alpha + \beta) + \beta = 180^\circ \text{ which yields } 2(\alpha + \beta) = 180^\circ \text{ or } \alpha + \beta = 90^\circ.$$

Then, from the right triangle we can write $r = 2R\cos\alpha$ where $\alpha \in [-0.5\pi, 0.5\pi]$

1.3.3 3D Cartesian Coordinates

In three-dimensional space, Cartesian coordinates are created by adding one more axis orthogonal to the 2-dimensional coordinate plane. It also passes through the same origin, and the order of the coordinates is defined by the same right-hand rule (Fig. 1.11a): while curling fingers of the right hand show the direction from the first to the second axis, the thumb shows the direction of the third axis. These axes are often called X, Y and Z but, of course, any other names can be used for them.

Skew coordinate systems can be created in the same way by adding the third axis which passes through the same origin. Such coordinate systems are used, for example, in crystallography where there are natural inclination angles following the shape of crystals.

1. Please correct the following formula

$$\mathbf{P} = \mathbf{P}_1 + u(\mathbf{P}_2 - \mathbf{P}_1) + v\big(\mathbf{P}_3 + u(\mathbf{P}_4 - \mathbf{P}_3) - \mathbf{P}_1 - u(\mathbf{P}_2 - \mathbf{P}_1)\big) \tag{2.1}$$

2. Please correct the following formula

$$\begin{aligned} x &= 1.8u \\ y &= 2u\cos(2\pi v) \\ z &= 2u\sin(2\pi v) \\ u, v &\in [0,1] \end{aligned} \tag{2.2}$$

3. Please correct the highlighted "cos" to "sin"

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$$\begin{aligned} x &= 0.9\cos(5u2\pi)\cos(u2\pi) = 0.9\cos(u10\pi)\cos(u2\pi) \\ y &= 0.9\cos(5u2\pi)\sin(u2\pi) = 0.9\cos(u10\pi)\cos(u2\pi) \\ u &\in [0, 1] \end{aligned} \tag{2.69}$$

So that the formulas will become:

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$$\begin{aligned} x &= 0.9\cos(5u2\pi)\cos(u2\pi) = 0.9\cos(u10\pi)\cos(u2\pi) \\ y &= 0.9\cos(5u2\pi)\sin(u2\pi) = 0.9\cos(u10\pi)\sin(u2\pi) \\ u &\in [0, 1] \end{aligned} \tag{2.69}$$

4. Please replace the figure on the next page. The typo is in the formulas of Figure 2.54c.

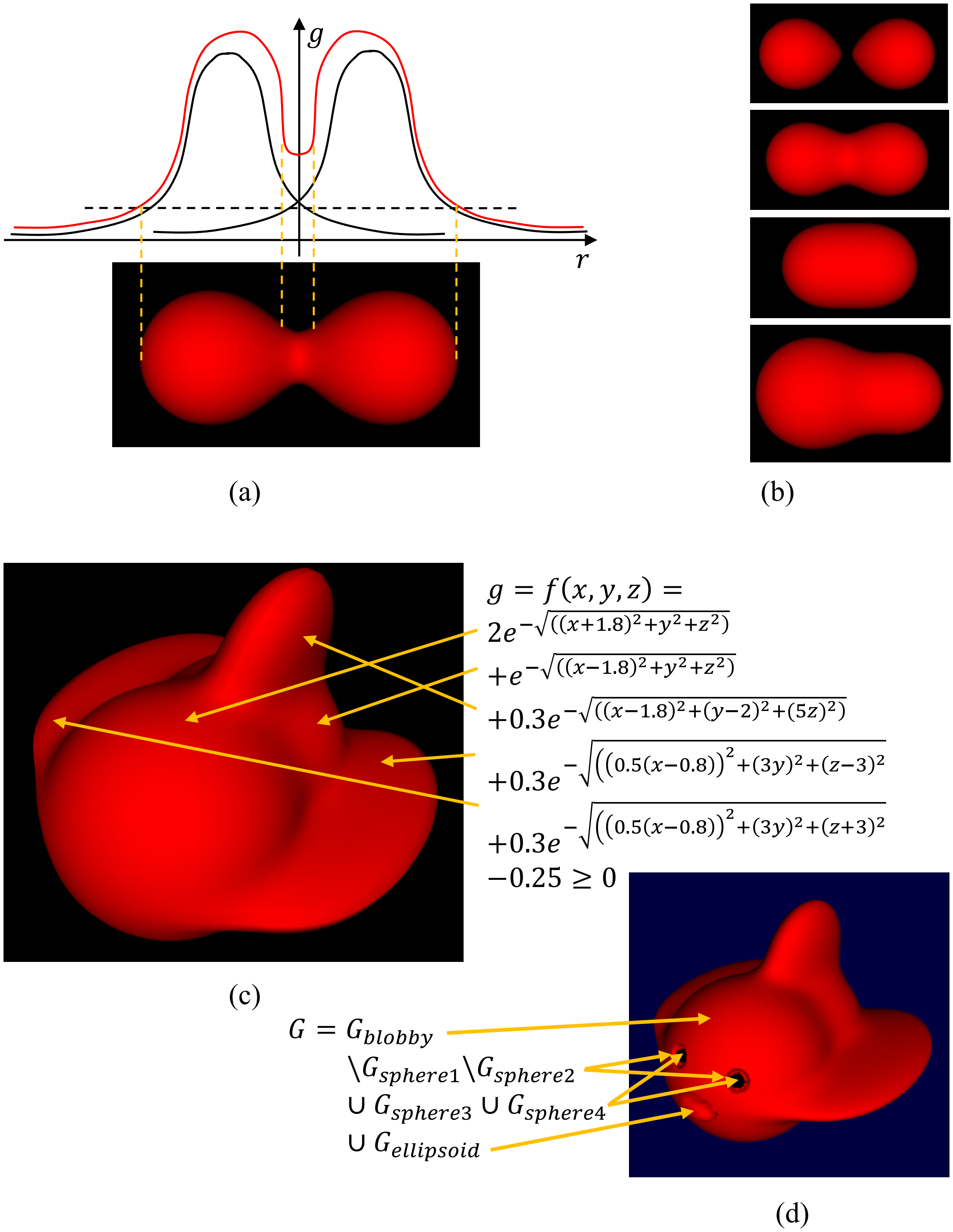

Figure 2.1 Defining complex blobby shape.