Answer on Question #37728 – Math – Integral Calculus

Solution.

Take the integral:

$$\int \sqrt{1-sinx}\ dx$$

Substitution:

$$u = 1 - \sin x \quad \rightarrow \quad \sin x = 1 - u$$

$$du = -\cos x\, dx \quad \rightarrow \quad dx = -\frac{du}{\cos x}$$

$$\cos x = \sqrt{1-(\sin x)^2} = \sqrt{1-(1-u)^2} = \sqrt{1-1+2u-u^2} = \sqrt{u(2-u)}$$

that's mean

$$dx = -\frac{du}{\cos x} = -\frac{du}{\sqrt{u(2-u)}}$$

So we can rewrite the integral

$$\int \sqrt{1-sinx}\ dx = -\int \sqrt{u}\cdot\frac{du}{\sqrt{u(2-u)}} = -\int \frac{du}{\sqrt{2-u}} =$$

Substitute:

$$s = 2 - u$$

$$ds = -du$$

$$= \int \frac{1}{\sqrt{s}} ds = 2\sqrt{s} + constant =$$

Substitute back for $s = 2 - u$

$$= 2\sqrt{2-u} + constant =$$

Substitute back for $u = 1 - \sin x$

$$= 2\sqrt{2-1+\sin x} + constant = 2\sqrt{1+\sin x} + C$$

Answer:

$$\int \sqrt{1-sinx}\ dx = 2\sqrt{1+\sin x} + C$$