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Complete the following problems by computing the following integrals. Show all work to receive full credit.

1.  $\int \sqrt{1 - \cos^2 x} \, dx$

$$\begin{aligned} \int \sqrt{1 - \cos^2 x} \, dx &= \int \sqrt{\sin^2 x} \, dx \\ &= \int \sin x \, dx \\ &= -\cos x + C \end{aligned}$$

2.  $\int \frac{2}{x\sqrt{1 - 4\ln^2 x}} \, dx$

$$\begin{aligned} \int \frac{2}{x\sqrt{1 - 4\ln^2 x}} \, dx &= \int \frac{2}{x} \cdot \frac{1}{\sqrt{1 - (2\ln x)^2}} \, dx \\ u &= 2\ln x \\ du &= \frac{2}{x} \, dx \\ &= \int \frac{1}{\sqrt{1 - u^2}} \, du \\ &= \sin^{-1} u + C \\ &= \sin^{-1}(2\ln x) + C \end{aligned}$$

3.  $\int \frac{2}{x^2 - 6x + 10} \, dx$

$$\begin{aligned} \int \frac{2}{x^2 - 6x + 10} \, dx &= \int \frac{2}{(x^2 - 6x + 9 - 9) + 10} \, dx \\ &= \int \frac{2}{(x - 3)^2 + 1} \, dx \\ &= 2 \tan^{-1}(x - 3) + C \end{aligned}$$