(1) Determine $\int \frac{\ln(x)}{\sqrt{x}}\, dx = I$

let $u = \ln(x)$ $\qquad dv = x^{-1/2}\,dx$

$du = \frac{1}{x}\,dx \qquad v = 2x^{1/2}$

$$I = \int u\,dv$$

$$= uv - \int v\,du$$

$$= \ln(x) \cdot 2x^{1/2} - \int 2x^{1/2} \cdot \frac{1}{x}\,dx$$

$$= 2x^{1/2}\ln(x) - 2\int x^{-1/2}\,dx$$

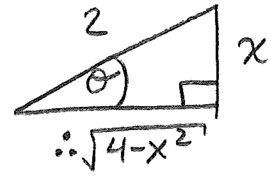
$$= \boxed{2x^{1/2}\ln(x) - 4x^{1/2} + C}$$

[5]

(2) Determine $\int \frac{1}{x\sqrt{4-x^2}}\,dx = I$

let $x = 2\sin\theta$

$dx = 2\cos\theta\,d\theta$



$$\therefore\ I = \int \frac{1 \cdot \cancel{2}\cos\theta}{\cancel{2}\sin\theta\sqrt{4-4\sin^2\theta}}\,d\theta$$

$$= \frac{1}{2}\int \frac{\cos\theta}{\sin\theta\sqrt{1-\sin^2\theta}}\,d\theta$$

$$= \frac{1}{2}\int \frac{\cancel{\cos\theta}}{\sin\theta \cdot \cancel{\cos\theta}}\,d\theta$$

$$= \frac{1}{2}\int \csc\theta\,d\theta$$

$$= \frac{1}{2}\ln\left|\csc\theta - \cot\theta\right| + C$$

$$= \boxed{\frac{1}{2}\ln\left|\frac{2}{x} - \frac{\sqrt{4-x^2}}{x}\right| + C}$$

or $$= \boxed{\frac{1}{2}\ln\left|\frac{2-\sqrt{4-x^2}}{x}\right| + C}$$

[10]