1) $u = 25 + x^2$ $\quad \frac{1}{2}\int \frac{1}{u}\,du = \frac{1}{2}\ln(25+x^2) + C$

$du = 2x\,dx$

2) $u = 2x$ $\quad \int \frac{du}{\sqrt{1-u^2}} = \arcsin 2x + C$

$du = 2dx$

3) $u = \ln 3x$ $\quad dv = dx$ $\quad \int \ln 3x\,dx = x\ln 3x - x + C$

$du = \frac{3}{3x} = \frac{1}{x}$ $\quad v = x$

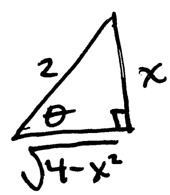
4) from formula booklet $\frac{1}{3}\arctan\frac{x}{3} + C$

5) $u = 1 - \cos 2x$ $\quad \frac{1}{2}\int \frac{1}{u^2}\,du = \frac{-1}{2(1-\cos 2x)} + C$

$du = 2\sin 2x\,dx$

6) $x = 2\sin\theta$

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



$= \int \frac{\sin\theta}{\cos\theta}\,d\theta$ $\quad u = \cos\theta$ $\quad -\int \frac{1}{u}\,du = -\ln\sqrt{4-x^2} + C$

$du = -\sin\theta\,d\theta$

7) $u = x^2$ $\quad \frac{1}{2}\int 2^u\,du = (\ln\sqrt{2})\,2^{x^2} + C$

$du = 2x\,dx$

8) $u = \cos 2x$ $\quad -\frac{1}{2}\int e^u\,du = -\frac{1}{2}e^{\cos 2x} + C$

$du = -2\sin 2x$

9) $\int_0^{\pi} \sin^2 x\,dx = \frac{1}{2}\int_0^{\pi}(1-\cos 2x)\,dx = \frac{\pi}{2}$

10) $u = \ln x$ $\quad du = \frac{1}{x}dx$ $\qquad \int \frac{1}{u}\,du = \ln\left|\ln|x|\right| + c$

11) $$\int_{\pi/4}^{\pi/2} \cot x\,dx = \int_{\pi/4}^{\pi/2} \frac{\cos x}{\sin x}\,dx = \int_{\sqrt{2}/2}^{1} \frac{1}{u}\,du = \ln\sqrt{2}$$

$u = \sin x$
$du = \cos x\,dx$

12) $u = 2x+1$
$du = 2x\,dx$
$x = \frac{u-1}{2}$

$$\frac{1}{2}\int_{-\infty}^{\infty} \frac{du}{u^2+4} = \int_{0}^{\infty} \frac{du}{4+u^2} = \lim_{t\to\infty}\left(\frac{1}{2}\tan^{-1}\frac{u}{2}\right)_0^t = \frac{\pi}{4}$$

13) $u = x^2$ $\quad dv = e^{-x}dx$
$du = 2x\,dx$ $\quad v = -e^{-x}$

$$\int x^2 e^{-x}dx = -x^2e^{-x} + 2\int xe^{-x}dx$$

$u = x$ $\quad dv = e^{-x}dx$
$du = dx$ $\quad v = -e^{-x}$

$$= -x^2e^{-x} + 2\left[-xe^{-x} + \int e^{-x}dx\right]$$

$$= -x^2e^{-x} - 2xe^{-x} - 2e^{-x}$$

$$\lim_{t\to\infty}\left(-t^2e^{-t} - 2te^{-t} - 2e^{-t}\right) = 2$$

14) $$\int \frac{-dx}{\sqrt{1-(x-3)^2}}$$

$u = x-3$
$du = dx$

$\arccos(x-3) + C$
OR
$-\arcsin(x-3) + C$