1) Evaluate the following integrals.

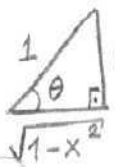
a) $\int_0^{\pi/3} \frac{dx}{\cos^2 x(9+\tan^2 x)} \overset{\uparrow}{=} \int_0^{\sqrt{3}} \frac{du}{9+u^2} = \frac{1}{3}\arctan\frac{u}{3}\Big|_0^{\sqrt{3}} = \frac{1}{3}\left(\arctan\frac{\sqrt{3}}{3} - \arctan 0\right)$

$u=\tan x,\ du=\sec^2 x\,dx$

$x=0 \Rightarrow u=0$

$x=\frac{\pi}{3} \Rightarrow u=\sqrt{3}$

$= \frac{1}{3}\left(\frac{\pi}{6}-0\right) = \frac{\pi}{18}$



b) $\int \frac{dx}{x-\sqrt{1-x^2}} \overset{\uparrow}{=} \int \frac{\cos\theta\, d\theta}{\sin\theta-\cos\theta}$

$x=\sin\theta$

$= \int \frac{\cos\theta(\sin\theta+\cos\theta)\,d\theta}{\sin^2\theta-\cos^2\theta}$

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

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

$= \frac{1}{4}\ln|\cos 2\theta| - \frac{1}{4}\ln|\sec 2\theta+\tan 2\theta| - \frac{1}{2}\theta + C$

$= \frac{1}{4}\ln|\cos^2\theta-\sin^2\theta| - \frac{1}{4}\ln\left|\frac{1+\sin 2\theta}{\cos^2\theta-\sin^2\theta}\right| - \frac{1}{2}\theta + C$

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

$= \frac{1}{2}\ln|1-2x^2| - \frac{1}{4}\ln|1+2x\sqrt{1-x^2}| - \frac{1}{2}\sin^{-1}x + C.$