Start here for
Question Number: **5**

a)   i) $A = 2\pi r^2 + 2\pi r h$

$v = 10 \ m^3$

$V = \pi r^2 h$

$\therefore 10 = \pi r^2 h$

$\dfrac{10}{r^2} = \pi r h$

$10 = \pi r h$

$\therefore \dfrac{10}{\pi r^2 h}$

$A = 2\pi r^2 + 2\pi r h$

$\dfrac{10}{\pi r^2 h}$

$= \dfrac{10 \times 2}{2 r}$

$= \dfrac{20}{r}$

$\therefore A = 2\pi r^2 + 2\pi r h$

ii) $(A) = 2\pi r^2 + \dfrac{20}{r}$

$(A)' = 4\pi r + (20 \ r^{-1})$

$(A)' = 4\pi r + -20 r$

$\therefore (A)' = 4\pi r - 20$

$\text{w} \ A' = 0$

$0 = 4\pi r - 20$

$+20 = 4\pi r$

$5 = \pi r \quad \therefore r = \dfrac{5}{\pi}$

when A

when $r = \dfrac{5}{\pi}$, $A = 2\pi\left(\dfrac{5}{\pi}\right) + \dfrac{20}{\left(\dfrac{5}{\pi}\right)}$

$\therefore A = 22$ $\left(\dfrac{5}{\pi}, 22\right)$

~~when~~ $A'' = 4\pi$

whe $A'' = \dfrac{5}{\pi}$, $A'' > 0$ $\therefore$ min-pt.

$A'' \therefore$ ~~minium point~~ ~~min pt~~ @ $\left(\dfrac{5}{\pi}, 22\right)$

b)   i) $\sec^2 x + \sec x \tan x = \dfrac{1 + \sin x}{\cos x}$

$\sec^2 x = \tan x$

$\tan x = \dfrac{\sin x}{\cos x}$

~~See~~ $\sec x + \tan x = \dfrac{1}{a}$ $\sec x \, a = 1$

$\therefore \not1 \not\tan x + 1$

$= 1 + \dfrac{\sin x}{\cos x}$

(ii) $\dfrac{d}{dx}$ $\dfrac{\sin x}{\cos x}$

$= -\sin x$

$\therefore \dfrac{1 + \sin x}{\cos x}$

$= \dfrac{1}{1 - \sin x}$

(iii) $\displaystyle\int_0^{\frac{\pi}{4}} \frac{1}{1-\sin x}\, dx$

$= \big[x - \cos x\big]_0^{\frac{\pi}{4}}$

$= \left[\frac{\pi}{4} - \cos\frac{\pi}{4}\right] - \left[\frac{\pi}{4} - \cos 0\right]$

$= \left[\frac{\pi}{4} - \cos\frac{1}{\sqrt{2}}\right] - \left[\frac{\pi}{4} - 1\right]$

$= \cos\frac{\pi}{4\sqrt{2}} - \frac{\pi}{4} - 1$

c) $\displaystyle\int_a^b \frac{1}{x}\, dx$

$= \left[x\right]_a^b = 1$

$A_1 + A_2 = 1$ $A_2 = \displaystyle\int_1^b \frac{1}{x}\, dx$

$A_1 = \displaystyle\int_a^1 \frac{1}{x}\, dx$ $\left[x\right]_1^b$

$= \left[x\right]_a^1$ $= \left[xb - x\right]$

$= x - ax$

$x - ax + xb - x$

$1 = (x-1)a + (x-1)b$

$1 = (x-1)(a+b)$

$a = \frac{1}{2} \qquad b = \frac{1}{2}$

You may ask for an extra Writing Booklet if you need more space to answer question 5.