Start here for Question Number: 5

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

~~Circumference = $2\pi r$~~ $V = 2\pi r^2 h$

$\longrightarrow$ ~~$10 = 2\pi$~~

$\therefore h = V / 2\pi r^2$

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

$A = 2\pi r^2 + 2\pi r \left(10 / 2\pi r^2 \right)$

$= 2\pi r^2 + \frac{20\pi r}{2\pi r^2}$

$= 2\pi r^2 + 10 / r$

(ii) ~~$dy/dx = 2\pi r$~~ $f(x) = 2\pi r^2 + 20/r$

$dy/dx = 4\pi r + \frac{r - 20}{r^2}$

$0 = \frac{4\pi r^3 + r - 20}{r^2}$

$\therefore r =$

(b) (i) Prove: $\sec^2 x + \sec x \tan x = \frac{1 + \sin x}{\cos^2 x}$

LHS $= \sec^2 x + \sec x \tan x$

$= \left(\frac{1}{\cos x} \right)^2 + \frac{1}{\cos x} + \frac{\sin}{\cos}$

$= \frac{1 + \cos x}{\cos^2 x} + \frac{\sin}{\cos x}$

$$= \frac{1+\cos x}{\cos^2 x} + \frac{\sin \cos x}{\cos^2 x}$$

(ii) $\cancel{\frac{1+\sin x}{\cos^2 x} = \frac{1}{1-\sin x}}$ Prove: $\frac{1+\sin x}{\cos^2 x} = \frac{1}{1-\sin x}$

$$LHS = \frac{1+\sin x}{\cos^2 x}$$

$$= \frac{1}{\cos^2 x} + \frac{\sin x}{\cos^2 x}$$

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

(c) Area $\int x^2\, dx$

$A1 = 1$

$$1 = \int_1^a \left(\frac{1}{x}\right)^2 dx$$

$$= \int_1^a \frac{-1}{x^2}\, dx$$

$$A2 = \int_1^b x^2\, dx$$

Additional writing space on back page.