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a). $V = 10\,m^3$.

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

$V = 10\,m^3$. $V = 2\pi r^2 h$

$10 = 2\pi r^2 h$

~~$\frac{10}{\pi} = 2r^2h$~~

$=$

~~$5 = \pi r^2$~~

~~$\frac{5}{\pi} = r^2$~~

~~$\sqrt{\frac{5}{\pi}} = r$~~

~~$\therefore 10 = 2 \times \pi \left(\sqrt{\frac{5}{\pi}}\right)^2 h =$~~

~~$10 = 2\pi \times \frac{5}{\pi} h$~~

~~$= 2\,\frac{5\pi}{\pi} h$~~

~~$= 2 \times 5h$~~

$=$

$10 = 2\pi r^2 h$

$\sqrt{\frac{10}{r}} = \pi h$

$=$

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

$\therefore A = 2\pi r^2 + 2 \times \sqrt{\frac{10}{r}}$

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

ii). $A = 2\pi r^2 + 2\pi r h$.

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

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

~~$= 4\pi r - 20r^{-2}$~~

$= 4\pi + (-20 r^{-2})$

$= 4\pi - 20 r^{-2}$

~~$A' = 0 \quad 0 = 4\pi r - 20r^{-2}$~~

~~$20r^{-2} = r$~~

~~$\frac{20}{r^2} = r$~~

~~$20 = r^3$~~

~~$\sqrt{20} = r$~~

~~$A'' =$~~

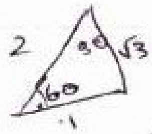
$0 = 40 - \frac{20}{r^2}$

$\frac{20}{r^2} = 40$

$20 = 40 r^2$

$\frac{1}{2} = r^2$

$\frac{1}{4} = 0.r$.



$\sin \frac{\sqrt{3}}{2}$ $\cos \frac{1}{2}$

$\frac{\sqrt{3}}{1}$ $\frac{\frac{1}{2}}{2}$

$y'' = -20v^{-2}$

$= 40v^{-3}$

$= 40(\frac{1}{4})^{-3} > 0$ $\cup$ min.

$v = \frac{1}{4}$ m.

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

$1 - \tan^2\theta + \sec x \tan x = \frac{1+\sin x}{\cos^2 x}$

$\cancel{1 - \frac{\cos^2 x}{\sin^2\theta} + \frac{1}{\cos x}, \frac{\cos\theta}{\sin\theta}} = \frac{1+\sin x}{\cos^2 x}$

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

$1 - \tan^2\theta + \frac{1}{\cos x} \times \frac{\cos x}{\sin x} = \frac{1+\sin x}{\cos^2 x}$

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

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

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

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

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

LHS = RHS.

ii). $\sec^2 x + \sec x \tan x = \frac{1}{1-\sin x}$

from (i). $\frac{1+\sin x}{\cos^2 x} = \frac{1}{1-\sin x}$

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

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

$= \frac{\sin x}{1-\sin x^2}$ $\qquad \frac{1}{1-\sin x} = \frac{1}{1-\sin x}$

$= \frac{1}{1-\sin^2 x}$ $\qquad$ LHS = RHS.

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

$= (1-\sin x)^{-1}$

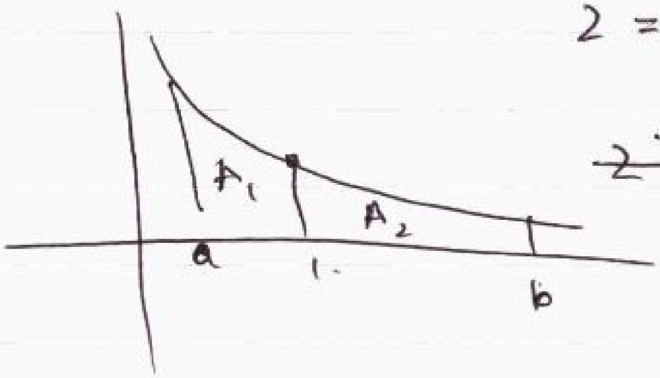
$= \frac{1-\sin x}{\cos x \times 0}\,dx$

$= \left[1-\sin x\right]_0^{\frac{\pi}{4}}$

$= 1-\sin\frac{\pi}{4} - 1$

$= -\frac{1}{\sqrt{2}}.$

c). $y = \frac{1}{x}$



$2 = \int_a^b \frac{1}{x}\,dx$

$\cancel{2 = [\ln x]_a^b}$ $2 = \int_1^b \frac{1}{x}\,dx$

$\cancel{2 = \ln b - \ln a}$ $1 = \frac{b^1}{b} - \frac{1}{1}\,dx$

$1 = \frac{1}{b} - 1\,dx$

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

$\cancel{2b = 1}$

$\cancel{b =}$ $2b = 1$

$b. = \frac{1}{2}$

$\int_a^1 \frac{1}{x}\,dx$

$1 = \left[\frac{1}{1} - \frac{1}{a}\right]$

$\cancel{1 = 1 - \frac{1}{a}}$ $1 + \frac{1}{a} = 1$

$\cancel{0 = -\frac{1}{a}}$ $\cdot\frac{1}{a} = 0$

$\cancel{a = 1}$ $=$

$=$

$a =$

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