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a) $V = 10\ m^3$ $A = Sa\ m^2$

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

$V = 10$

$V = \pi r^2 \times h$

$10 = \pi r^2 h$

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

$\frac{dA}{dr} = 4\pi r + -20r^{-2}$

when $\frac{dA}{dr} = 0$

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

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

$r^{-2} = \frac{4\pi}{20} r \quad (\div r)$

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

$-3 \log_e r = \log_e \frac{4\pi}{20} \quad (\div -3)$

$\log_e r = \log_e \frac{\frac{4\pi}{20}}{-3}$

$=$

b i) $\sec^2 x + \sec x \cdot \tan x$

$= \frac{1}{\tan^2 x} + \frac{1}{\tan x} \cdot \tan x$

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

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

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

ii) $\cos^2 x = 1 - \sin^2 x$

$\therefore$ if $\sec^2 x + \sec x \cdot \tan x = \dfrac{1+\sin x}{\cos^2 x}$

$\sec^2 x + \sec x \cdot \tan x = \dfrac{1+\sin x}{1-\sin^2 x}$

$\therefore = \dfrac{1}{1-\sin^2 x}$

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

$\dfrac{-\sin x \times \cos x}{1-\sin x}$

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

$= \left(-\sin\frac{\pi}{4} \times \ln\left(1-\sin\left(\frac{\pi}{4}\right)\right)\right) - \left(-\sin 0 \times \ln(1-\sin 0)\right)$

$=$

c) $y = \frac{1}{x} \qquad x > 0$

$\displaystyle\int_a^1 \frac{1}{x} \cdot dx$

$=$

Additional writing space on back page.