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① ⓑ $\int_0^1 \left(\int_0^{\sqrt{15}} xy\left(\sqrt{x^2+1}\right)^{-1} dx \right) dy$

$\rightarrow$ let $x = \tan u \rightarrow dx = \sec^2 u$

$\sqrt{x^2+1} = \sec u \rightarrow \sqrt{15} \rightarrow \arctan\sqrt{15}$, $0 \rightarrow 0$

$\Rightarrow \int_0^{\tan^{-1}\sqrt{15}} y \frac{\tan u \sec^2 u}{\sec u} du = \int_0^{\tan^{-1}\sqrt{15}} y \tan u \sec u \, du = y \int_0^{\tan^{-1}\sqrt{15}} d\sec u$

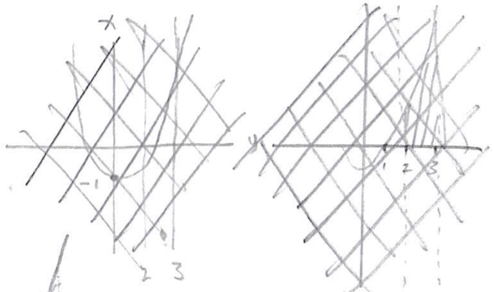
$= y \left(\sec u \right]_0^{\arctan\sqrt{15}})$

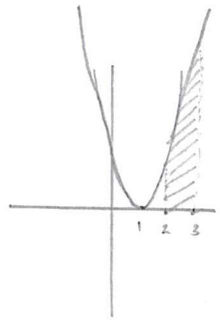
$= y(4-1)$

$= 3y$

$\int_0^1 3y \, dy = \frac{3}{2}y^2 \Big]_0^1 = \frac{3}{2}$ ▨

② ⓐ S $\rightarrow$





$V = \int_2^3 \int_0^{(x-1)^2} \frac{2y}{(x-1)^2} dy \, dx$

$= \int_2^3 \left(\frac{y^2}{(x-1)^2} \right]_0^{(x-1)^2} dx$

$= \int_2^3 (x-1)^2 \, dx$

$= \left(\frac{1}{3}x^3 - x^2 + x \right]_2^3$

$= \frac{7}{3}$

3. a) batas, bidang xy, bidang zy dan ~~xz~~

$0 \leq z \leq 12 - 4x - 2y$

$0 \leq y \leq 6 - 2x$

$0 \leq x \leq 3$

$$\int_0^3 \int_0^{6-2x} \int_{0}^{12-4x-2y} dz\, dy\, dx$$

$$\cancel{= \int_0^3 \int_0^{6-2x} 4x(12-4x-12y)\, dy\, dx}$$

$$\cancel{= \int_0^3 \left(48x - 16x^2 - \frac{8yx}{2}\right)\Big]_0^{6-2x} dx} \quad \cancel{= \int_0^3 16(x-3)^2\, dx}$$

$$\cancel{= 16\int_0^3 (x-3)^2\, dx}$$

$$\cancel{= \frac{16}{3}(x-3)^3\Big]_0^3}$$

$$\cancel{= -144}$$

$$\int_0^3 \int_0^{6-2x} -8x(2x+y-6)\, dy\, dx$$

$$= \int_0^3 16(x-3)^2 x\, dx$$

$$= 108$$