(13) $\int_0^4 \int_0^{(1/2)(4-x)} \int_0^{(i/4)(12-3x-6y)} dzdydx \Rightarrow 0 \le x \le 4;\ 0 \le y \le \frac{1}{2}(4-x);\ 0 \le z \le \frac{1}{4}(12-3x-6y)$

$when\ \ x = y = 0,\ z \le (1/4)(12-3x-6y) = 3,\ \therefore\ 0 \le z \le 3$

$\sin ce\ \ 4z = 12-3x-6y \Leftrightarrow y = (1/6)(12+3x-4z)$

$when\ \ y = 0,\ \ 12+3x-4z = 0 \Leftrightarrow x = (-1/3)(4z-12)$

$$\therefore \iiint_Q dQ = \int_0^3 \int_0^{(-1/3)(4z-12)} \int_0^{(1/6)(12+3x-4z)} dydxdz$$

(15) $\int_0^1 \int_y^1 \int_0^{\sqrt{1-y^2}} dzdxdy \Rightarrow 0 \le y \le 1;\ \ y \le x \le 1$

$by\ rearranging \qquad 0 \le x \le 1;\ \ 0 \le y \le x$

$$\therefore \qquad \iiint_Q dQ = \int_0^1 \int_0^x \int_0^{\sqrt{1-y^2}} dzdxdy$$

(19) $x = 4-y^2,\ z = 0,\ z = x \Rightarrow 0 \le z \le x;\ 0 \le x \le 4-y^2;\ -2 \le y \le 2$

$$V = \int_{-2}^2 \int_0^{4-y^2} \int_0^x dzdxdy = \frac{256}{15}$$

(21) $x^2 + y^2 + z^2 = a^2 \Rightarrow z = \pm\sqrt{a^2 - (x^2 + y^2)}$

$if\ \ z = 0 \Rightarrow x^2 + y^2 = a^2 \Rightarrow y = \pm\sqrt{a^2 - x^2} \Rightarrow -a \le x \le a$

Since f(x,y,z) is symmetric we only need to find the volume in 1 quadrant and multiply by 8.

$$\therefore V = 8\int_0^a \int_0^{\sqrt{a^2-x^2}} \int_0^{\sqrt{a^2-(x^2+y^2)}} dzdydx = 8\int_0^a \int_0^{\sqrt{a^2-x^2}} \sqrt{a^2 - (x^2 + y^2)}dydx$$