$\boxed{A}$ $F(x,y) = \begin{cases} Cx^2y(x+y^2) & 0 \le y \le 3,\ 0 \le x \le 2 \\ 0 & \text{otherwise} \end{cases}$

$x^3y + x^2y^3$

$3x^2y + 2xy^3$

$\boxed{C\left[3x^2 + 6xy^2\right]}$

$\boxed{B}$ $\int_0^3 3x^2 \cdot dy + \int_0^3 6xy^2 \cdot dy$

$3x^2 \int_0^3 dy + 6x \int_0^3 y^2\, dy$

$3x^2 [y]_0^3 + 6x\left[\frac{1}{3}y^3\right]_0^3$

$9x^2 + 54x$

$\int_0^2 9x^2\, dx + \int_0^2 54x\, dx$

$9\left[\frac{1}{3}x^3\right]_0^2 + 54\left[\frac{1}{2}x^2\right]_0^2$

$c(24 + 108) = 1$

$\boxed{C = \frac{1}{132}}$

Eduardo Fuenta

10.18.22

$\boxed{C}$ $f_x(X) = \int_0^3 f(x,y) \cdot dy$

$\int_0^3 \frac{1}{132}(3x^2 + 6xy^2)\, dy$

$\frac{1}{132} \int_0^3 3x^2 + 6xy^2 \cdot dy$

$\frac{1}{132} \int_0^3 3x^2 dy + \frac{1}{132} \int_0^3 6xy^2 dy$

$\frac{3x^2}{132} \int_0^3 dy + \frac{6x}{132} \int_0^3 y^2\, dy$

$\frac{3x^2}{132}[y]_0^3 + \frac{6x}{132}\left[\frac{1}{3}y^3\right]_0^3$

$\frac{9x^2}{132} + \frac{54x}{132}$

$\frac{9x^2 + 54x}{132}$

$\boxed{f_x(X) \begin{cases} \frac{9x^2+54x}{132} & ;\ 0 \le x \le 2 \\ 0 & \text{other} \end{cases}}$

D

$$\frac{\frac{1}{132}(3x^2+6xy^2)}{\frac{9}{132}\cdot(x^2+6x)} \to \frac{\frac{1}{132}\cdot 3x\cdot(x+2y^2)}{\frac{9}{132}\cdot x\cdot(x+6)} \to \frac{\frac{3}{132}(x+2y^2)}{\frac{9}{132}(x+6)}$$

$$\int_0^3 y\cdot\frac{1}{3}\left(\frac{x+2y^2}{x+6}\right)\cdot dy$$

$$\frac{1}{6(x+6)}\int_0^9 (2u+x)\,du$$

$$\frac{1}{3(x+6)}\int_0^9 u\,du + \frac{x}{6(x+6)}\int_0^9 du$$

$$\frac{27}{2(x+6)} + \frac{ux}{6(x+6)}\Bigg|_{u=0}^{9}$$

$$\frac{27}{2(x+6)} + \frac{3x}{2(x+6)}$$

$$\frac{3x+27}{2(x+6)}$$

$$\boxed{\frac{3(x+9)}{2(x+6)}}$$

E $p(x\leq y) = \int_0^2\int_x^3 \frac{1}{132}(3x^2+6xy^2)\,dx\,dy$

$$\int_0^2\int_x^3 \frac{1}{132}(3x^2+6xy^2)\,dy\,dx$$

$$\frac{1}{132}\int_x^3 3x^2dy + \frac{1}{132}\int_x^3 6xy^2dy$$

$$\frac{3x^2}{132}\int_x^3 dy + \frac{6x}{132}\int_x^3 y^2dy$$

$$\frac{3x^2}{132}\left[y\right]_x^3 + \frac{6x}{132}\left[\frac{1}{3}y^3\right]_x^3$$

$$\frac{9x^2}{132} - \frac{3x^3}{132} + \frac{54x}{132} - \frac{2x^4}{132}$$

$$\int_0^2 \frac{-2x^4-3x^3+9x^2+54x}{132}\,dx$$

$$\frac{1}{132}\int_0^2 -2x^4-3x^3+9x^2+54x\,dx$$

$$\frac{1}{132}\left[-\frac{2}{5}x^5-\frac{3}{4}x^4+3x^3+27x^2\right]_0^2$$

$$= \boxed{0.812}$$