2) b) $F(x) = \begin{cases} f(x), & x \leq x_0 \\ ax+b, & x > x_0 \end{cases}$ $\Delta 3N2$

$f(x_0) = ax_0 + b$

$(f(x))' = (ax+b)' \quad f'(x_0) = a$

$b = f(x_0) - f'(x_0) \cdot x_0$

$F(x) = \begin{cases} f(x) \\ f'(x_0) \cdot x + f(x_0) - f'(x_0) \cdot x_0 \end{cases}$

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5) a) $\int_0^2 \int_0^{4-x^2} xy\,dy\,dx = \int_0^2 dx \int_0^{4-x^2} xy\,dx$

$\int_0^{4-x^2} xy\,dy = \frac{xy^2}{2} = \frac{x(4-x^2)^2}{2}$

$\int_0^2 \frac{x(4-x^2)^2}{2} dx = \frac{\int_0^2 x(4-x^2)^2 dx}{2} = \frac{\int_0^2 (x^5 - 8x^3 + 16x)\,dx}{2} =$

$= \frac{\frac{x^6}{6} - 2x^4 + 8x^2}{2} = \frac{(x^2-4)^3}{12} \Big|_0^2 = \frac{+64}{12} = \frac{16}{3}$

5) b) $\int_0^1 \int_{1-x}^{\sqrt{1-x^2}} x^2 y\,dy\,dx = \int_0^1 dx \int_{1-x}^{\sqrt{1-x^2}} x^2 y\,dy$

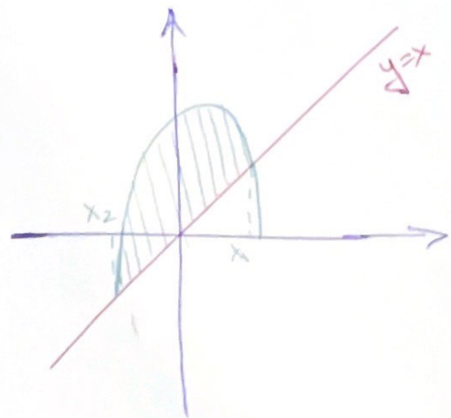
$\int_{1-x}^{\sqrt{1-x^2}} x^2 y\,dy = x^2 \int_{1-x}^{\sqrt{1-x^2}} y\,dy = x^2 \cdot \frac{y^2}{2} \Big|_{1-x}^{\sqrt{1-x^2}} =$

$= x^2 \cdot \left(\frac{(\sqrt{1-x^2})^2 - (1-x)^2}{2} \right) = x^2 \left(\frac{1-x^2}{2} - \frac{(1-x)^2}{2} \right) = x^3(1-x)$

$\int_0^1 x^3(1-x)\,dx = \int_0^1 (x^3 - x^4)\,dx = \int_0^1 x^3 dx - \int_0^1 x^4 dx = \frac{1}{4} - \frac{1}{5} = \frac{1}{20}$

5)c)

$y = x \;,\; y = 3 - x^2$



$x = 3 - x^2$

$x^2 + x = 3$

$\left(x + \frac{1}{2}\right)^2 = 3 + \frac{1}{4} = \frac{13}{4}$

$\left|x + \frac{1}{2}\right| = \frac{\sqrt{13}}{2} \quad x = -\frac{1}{2} \pm \frac{\sqrt{13}}{2}$

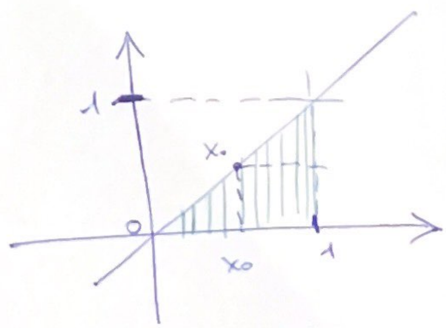
$$\int_{x_1}^{x_2}\int_{x}^{3-x^2} x\,dy\,dx = \int_{x_1}^{x_2} x(3 - x^2 - x)\,dx = \int_{x_1}^{x_2} (3x - x^3 - x^2)\,dx =$$

$$= \frac{3}{2}x^2 - \frac{x^4}{4} - \frac{x^3}{3}\Big|_{x_1}^{x_2} = \frac{3}{2}x^2 - \frac{x^4}{4} - \frac{x^3}{3}\Big|_{\frac{-1+\sqrt{13}}{2}}^{\frac{-1-\sqrt{13}}{2}}$$

5)d)

$$\int_0^1\int_y^1 x^2 \sin(xy)\,dx\,dy = \int_0^1 x^2 \int_0^x \sin(xy)\,dx\,dy =$$

$$= -\frac{\cos xy}{x}\Big|_0^x = \frac{-\cos x^2}{x} + \frac{1}{x}$$



$$\int_0^1 -x\cdot\cos x^2\,dx + \int_0^1 x\,dx$$

$$\int_0^1 x\,dx = \frac{x^2}{2}\Big|_0^1 = \frac{1}{2}$$

$$\int_0^1 x\cos x^2\,dx = \int_0^1 \cos y\,\frac{dy}{2} = \frac{\sin y}{2}\Big|_0^1 = \frac{\sin 1}{2}$$

$y = x^2 \;,\; dy = 2x\,dx$

$$\frac{1}{2} - \frac{\sin 1}{2} = \frac{1 - \sin 1}{2}$$