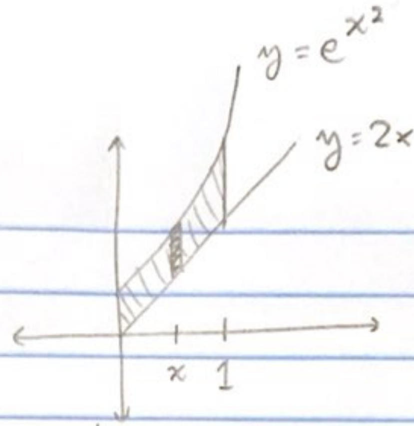
7)



Type I.

Set-up: $\boxed{V = \int_0^1 2\pi x \left(e^{x^2} - 2x\right) dx}$

$= 2\pi \left(\int_0^1 x e^{x^2} dx - \int_0^1 2x^2 \, dx \right)$

(use $u = x^2$)

$= 2\pi \left(\left[\frac{1}{2} e^{x^2} \right]_0^1 - \left[\frac{2x^3}{3} \right]_0^1 \right)$

$= 2\pi \left(\frac{1}{2} e - \frac{1}{2} - \left(\frac{2}{3} - 0 \right) \right)$

$= \pi \left(e - 1 - \frac{4}{3} \right) = \boxed{\pi \left(e - \frac{7}{3} \right)}$

11) Set-up : $\boxed{\frac{1}{3-0} \int_0^3 \frac{x+7}{x^{1/2}} \, dx}$

$= \frac{1}{3} \int_0^3 \frac{x}{x^{1/2}} + \frac{7}{x^{1/2}} \, dx$

$= \frac{1}{3} \int_0^3 x^{1/2} + 7x^{-1/2} \, dx$

$= \frac{1}{3} \left[\frac{2}{3} x^{3/2} + 7(2x^{1/2}) \right]_0^3$

$= \frac{1}{3} \left(\frac{2}{3} (\sqrt{3})^3 + 14\sqrt{3} - 0 \right) = \boxed{\frac{16\sqrt{3}}{3}}$

12) $\int_1^2 x^3 \ln x \, dx \quad \left[\begin{array}{ll} u = \ln x & dv = x^3 dx \\ du = \frac{1}{x} dx & v = \frac{x^4}{4} \end{array} \right]$

$$= \left[\frac{x^4}{4} \ln x \right]_1^2 - \int_1^2 \frac{x^4}{4} \cdot \frac{1}{x} \, dx$$

$$= \left[\frac{x^4}{4} \ln x \right]_1^2 - \frac{1}{4} \int_1^2 x^3 \, dx$$

$$= \left[\frac{x^4}{4} \ln x \right]_1^2 - \left[\frac{x^4}{16} \right]_1^2$$

$$= 4 \ln 2 - 0 - \left(1 - \frac{1}{16}\right)$$

$$= \boxed{4 \ln 2 - \frac{15}{16}} \quad = \ln 16 - \frac{15}{16}$$ (using rule of logs)

16) $\int x^2 e^x \, dx \quad \left[\begin{array}{ll} u = x^2 & dv = e^x dx \\ du = 2x dx & v = e^x \end{array} \right]$

$$= x^2 e^x - 2 \int x e^x \, dx$$

$\left[\begin{array}{ll} u = x & dv = e^x dx \\ du = dx & v = e^x \end{array} \right]$

$$= x^2 e^x - 2\left(x e^x - \int e^x dx \right)$$

$$= x^2 e^x - 2(x e^x - e^x) + C$$

$$= \boxed{x^2 e^x - 2x e^x + 2e^x + C}$$

$$= e^x (x^2 - 2x + 2) + C$$