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1) $2\pi \int_0^2 x^2 \, dx$

$u = x^2$
$du = 2x \, dx$
$x \, dx = \frac{du}{2}$

$2\pi \int_0^2$

$2\pi \frac{x^{2+1}}{2+1} \Big|_0^2 = 2\pi \cdot \frac{x^3}{3} \Big|_0^2$

$\frac{2\pi (2)^3}{3} - \frac{2\pi (0)^3}{3} = \frac{2\pi 8}{3} = \frac{2 \cdot 3{,}14 \cdot 8}{3} = \boxed{16{,}75}$

2) $2\pi \int_0^{\sqrt{2}} (4x - 2x^3) \, dx$

$2\pi \int_0^{\sqrt{2}} 4x \, dx - 2\pi \int_0^{\sqrt{2}} 2x^3 \, dx$

$8\pi \int_0^{\sqrt{2}} x \, dx - 4\pi \int x \, dx$

$8\pi \frac{x^{1+1}}{1+1} \Big|_0^{\sqrt{2}} - 4\pi \frac{x^{3+1}}{3+1} \Big|_0^{\sqrt{2}}$

$8\pi \frac{x^2}{2}\Big]_0^{\sqrt{2}} - 4\pi \frac{x^4}{4}\Big]_0^{\sqrt{2}} = 4\pi x^2\Big]_0^{\sqrt{2}} - \pi x^4\Big]_0^{\sqrt{2}}$

$4\pi(\sqrt{2})^2 - 4\pi(0)^2 - [\pi(\sqrt{2})^4 - \pi(0)^4$

$4\pi 2 - 0 - \pi(2^{1/2})^4 - 0$

$8\pi - \pi 2^2 = 8\pi - 4\pi = 4\pi$ ou $\boxed{12,57}$

3) $\pi \int_0^2 x^2 \, dx$

$\pi \int_0^2 \frac{x^{2+1}}{2+1}\Big]_0^2 = \pi \int_0^2 \frac{x^3}{3}\Big]_0^2 = \pi \frac{2^3}{3} - \pi \frac{0^3}{3}$

$\pi \cdot \frac{8}{3} = \boxed{8,37}$

4) $\frac{\pi}{16} \int_0^4 x^4 \, dx$

$\frac{\pi}{16} \int_0^4 \frac{x^{1+4}}{4+1}\Big]_0^4 = \frac{\pi}{16} \frac{x^5}{5}\Big]_0^4 = \frac{\pi}{16} \frac{x^5}{5} - \frac{\pi}{16} \frac{x^5}{5}$

$\frac{\pi}{16}\frac{4^5}{5} - \frac{\pi}{16}\frac{0^5}{5} = \frac{\pi}{16}\frac{256}{5} - 0 = \frac{256\pi}{80}$

$\frac{1024\pi}{80} = \boxed{40.19}$

5) $\pi \int_1^2 (x^2)^2\,dx = \pi \int_1^2 x^4 \cdot dx \rightarrow \pi \cdot \frac{x^{4+1}}{5}\Big]_1^2 \rightarrow$

$\pi \frac{x^5}{5}\Big]_1^2 \rightarrow \pi\frac{(2)^5}{5} - \frac{\pi(1)^2}{5} \rightarrow \pi\frac{32}{5} - \frac{\pi}{5} \rightarrow \frac{31\pi}{5}$

$\boxed{19.47}$