$$\int \left(\frac{x^{13}}{13}+\frac{3x^{10}}{10}+\frac{3x^{7}}{7}+\frac{x^{4}}{4}\right)12x^2\,dx$$

u

integral of $x^{12}+3x^9+3x^6+x^3$

$=(x^4+x)^3$

$=x^3(x^3+1)^3 \to u$

$v' \to v = 4x^3+C$

Pick $c=1$!

$$=\left(\frac{x^{13}}{13}+\frac{3x^{10}}{10}+\frac{3x^{7}}{7}+\frac{x^{4}}{4}\right)(4x^3+1)-\int x^3(x^3+1)^3(4x^3+1)\,dx$$

$$=u(4x^3+1)-\int (x^4+x)^3\cdot(4x^3+1)\,dx$$

$w=x^4+x$

$$=u(4x^3+1)-\int w^3\,dw$$

$$=\left(\frac{x^{13}}{13}+\frac{3x^{10}}{10}+\frac{3x^{7}}{7}+\frac{x^{4}}{4}\right)(4x^3+1)-\frac{1}{4}(x^4+x)^4+C$$