$= \frac{x^3}{3} - 2\cdot\frac{x^2}{2} - 3\cdot x + C$

$= \frac{1}{3}x^3 - x^2 - 3x + C$

(v) $\int [f(x)]^n f'(x)\,dx = \frac{f(x)^{n+1}}{n+1} + C$

Q4: $\int \frac{1}{(2x+3)^4}\,dx = \int \frac{1}{2}(2x+3)^{-4}(2)\,dx = \frac{(2x+3)^{-3}}{2(-3)} = -\frac{1}{6(2x+3)^3} + C$

Q5: $\int x\sqrt{x^2-1}\,dx = \int (x^2-1)^{\frac{1}{2}}(x)\,dx$

$= \int f(x)\, x\, \frac{1}{2} f'(x)\,dx = \frac{1}{2}\left[\int f(x)\cdot f'(x)\,dx\right]$

$= \frac{1}{2}\left[\frac{(x^2-1)^{\frac{3}{2}}}{\frac{3}{2}} + C\right] = \frac{1}{3}(x^2-1)^{\frac{3}{2}} + C$

$f(x) = x^2 - 1$

$f'(x) = 2x$

$\Rightarrow \frac{1}{2} f'(x) = x$

Q6: $-\int \frac{x}{x+2}\,dx = \int \left(1 - \frac{2}{x+2}\right)dx$

$= \int 1\,dx - 2\int \frac{1}{(x+2)}\,dx = x - 2\ln(x+2) + C$ (using (v))

$x+2 \;\big|\; \frac{1}{x \;/\; x+2}$

-2

(v) $\int \frac{1}{x}\,dx = \ln x$

$\int \frac{f'(x)}{f(x)}\,dx = \ln f(x)$, 1

$\frac{d}{dx}[\ln f(x)] = \frac{1}{f(x)} f'(x)$

Quiz: $\int \frac{1}{x}\,dx = \int \frac{1}{(x)^{\frac{1}{2}}}\,dx = \frac{(x)^{\frac{1}{2}}}{\frac{1}{2}} + C = 2\sqrt{x} + C$

$\therefore \int f'(x)\,dx = \ln f(x) + C$

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