Anti-differentiation (integration): more complex examples

Sunday, December 01, 2013
7:24 AM

Anti-differentiation = integration

$$\int 5x\,dx = \frac{5x^2}{2} + c$$

if $y = \frac{5x^2}{2} + 15$

$$\frac{dy}{dx} = \frac{\cancel{2}\times 5x^2}{\cancel{2}} + 15$$

$$= 5x^2$$

① $\int \frac{8}{x^2}\,dx$

$= \int 8x^{-2}\,dx$

$= \frac{8x^{-1}}{-1} + c$

$= -8x^{-1} + c$

$= \frac{-8}{x} + c$ ✓

check: $y = -8x^{-1} + 4$

$y = -\frac{8}{x} + 4$

$\frac{dy}{dx} = -1 \times -8x^{-2}$

$= 8x^{-2}$

$= \frac{8}{x^2}$

② $\int \frac{3}{\sqrt[4]{x^3}}\,dx =$

$= \int \frac{3}{x^{\frac{3}{4}}}\,dx$

$= \int 3x^{\frac{-3}{4}}\,dx$

$= \int 3x^{-0.75}\,dx$

$= \frac{3x^{-0.75+1}}{-0.75+1} + c$

$= \frac{3x^{0.25}}{0.25} + c$

$= 12x^{0.25} + c$

$= 12x^{\frac{1}{4}} + C$ ✓

check :

if $y = 12x^{\frac{1}{4}} + c$

$\frac{dy}{dx} = \frac{1}{4} \times 12x^{\frac{1}{4}-1}$

$= 3x^{-\frac{3}{4}}$

$= \frac{3}{x^{\frac{3}{4}}} = \frac{3}{\sqrt[4]{x^3}}$

③ $\int (2x-1)^2\,dx =$

$\int 4x^2 - 4x + 1x^0\,dx$

$= \frac{4x^3}{3} - \frac{4x^2}{2} + x + c$

$= \frac{4x^3}{3} - 2x^2 + x + c$ ✓

check:

$y = \frac{4}{3}x^3 - 2x^2 + x + 6$

$\frac{dy}{dx} = \frac{4}{\cancel{3}} \times \cancel{3}x^2 - 4x + 1$

$= 4x^2 - 4x + 1$

$= (2x-1)^2$

x^{4} $\sqrt{x}$