Integral Calculus lesson 1 - Anti-differentiation (integration)

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Important Rule 1: If $\frac{dy}{dx} = ax^n$ then $y = \frac{ax^{n+1}}{n+1} + c$ for $n \neq 1$.

Equivalently, $\int ax^n \, dx = \frac{ax^{n+1}}{n+1} + c$.

1 Solve for y in the following:

1.1 $\frac{dy}{dx} = x^2$

Use rule 1 as above. Substitute $n = 2$ and $a = 1$ results in $y = \frac{1 * x^{2+1}}{2+1} + c = \frac{x^3}{3} + c$.

1.2 $\frac{dy}{dx} = 3x^2 + 4x - 3$

Apply rule 1 to each of the terms.

$y = \frac{3x^{2+1}}{2+1} + \frac{4x^{1+1}}{2} - 3x + c$. Simplifying,

$y = x^3 + 2x^2 - 3x + c$

1.3 $\frac{dy}{dx} = \frac{7}{6}x$

Apply rule 1. $y = \frac{\frac{7}{6}x^{1+1}}{1+1} + c = \frac{7}{12}x^2 + c$

2 Evaluate the following integrals:

2.1 $\int x^2 + x + 1 \, dx$

Apply rule 1 to each term.

$y = \frac{x^{2+1}}{2+1} + \frac{x^{1+1}}{2} + 1x + c$. Simplifying,

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

2.2 $\int -x - 2 \, dx$

Apply rule 1 to each term.

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