Penyelesaian Tugas Kalkulus 8

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1. $\int \frac{x^4 + 4}{x^3 + 3 \cdot 4x + 7}\, dx$

$\Rightarrow \int \frac{x^2 + 4}{x^3 + 12x + 7}\, dx$

☆ $mis: g(x) = x^3 + 12x + 7$

$g'(x) = 3x^2 + 12$

$= 3(x^2 + 4)$

☆ $x^2 + 4 = \frac{1}{3}(3x^2 + 12)$

$= \frac{1}{3}\, g'(x)$

☆ $\int \frac{1/3\, g'(x)}{g(x)}\, dx = 1/3 \ln |(g(x))| + C$

$= 1/3 \ln |x^3 + 12x + 7| + C$

2. $\int \frac{x + 3}{x^2 + 2 \cdot 3x + 9}\, dx$

$\Rightarrow \int \frac{x + 3}{x^2 + 6x + 9}\, dx$

☆ $mis: g(x) = x^2 + 6x - 9$

$g'(x) = 2x + 6$

☆ $x + 3 = \frac{1}{2}(2x + 6)$

☆ $\int \frac{1/2\, g'(x)}{g(x)}\, dx = 1/3 \ln |g(x)| + C$

$= 1/2 \ln |x^2 + 6x - 9| + C$

3. $\int \frac{9x^3}{9x^2-3}\,dx$

☆ $9x^2-3\overline{)9x^3}\ \Big|\ x$

$\frac{9x^3-3x}{3x}$

☆ $\int \frac{9x^3}{9x^2-3}\,dx = \int (x+\frac{3x}{9x^2-3})\,dx$

$\Rightarrow \int x\,dx + \int \frac{3x\,dx}{9x^2-3}$

✿ $\int x\,dx = \frac{1}{2}x^2$

✿ $\int \frac{3x}{9x^2-3}\,dx$

▶ $mis: g(x) = 9x^2-3$

$g'(x) = 18x$

▶ $\int \frac{g'(x)}{g(x)} = \ln|g(x)| + C$

$\Rightarrow \int \frac{3x}{9x^2-3} = \int \frac{1/6\,(18x)}{9x^2-3} = 1/6\,\ln|9x^2-3|$

☆ $\int \frac{9x^3}{9x^2-3} = \int x\,dx + \int \frac{3x}{9x^2-3}\,dx$

$= \frac{1}{2}x^2 + \frac{1}{6}\ln|9x^2-3|$

4. $\int \frac{x^4-3x^2+4x-9}{x^2+9x+81}\,dx$

$\Rightarrow \int \frac{x^4-3x^2+4x-9}{x^2+9x+81}\,dx$

☆ $x^2+9x+81\overline{)x^4-3x^2+4x-9}\ \Big|\ x^2+9x-165$

$\frac{x^4+9x^3+81x^2}{9x^3-84x^2+4x-9}$

$\frac{9x^3-81x^2+729x}{-165x^2-725x-9}$

$$\frac{-165x^2 - 1485x - 13365}{760x - 13356}$$

☆ $\int \left(x^2 + 9x - 165 + \frac{760x - 13356}{x^2 + 9x + 81}\right) dx$

✿ $\int (x^2 + 9x - 165)\, dx = \frac{1}{3}x^3 + \frac{9}{2}x^2 - 165x + C$

5. $\int \frac{9}{x^2 + 4x + 4^2}\, dx$

$\Rightarrow \int \frac{9}{x^2 + 4x + 16}\, dx$

☆ $2b = 4$

$b = 2$

$c = 16$

$p = \sqrt{c - b^2}$

$= \sqrt{16 - 2^2}$

$= \sqrt{16 - 4}$

$= \sqrt{12}$

☆ $\int \frac{9}{x^2 + 4x + 16}\, dx = \frac{1}{p} \arctan \frac{x + b}{p} + C$

$= \frac{1}{\sqrt{12}} \arctan \frac{x + 2}{\sqrt{12}} + C$