Thứ ngày

Ex1: a) $f(x) = 5x^4 - 2x^5$, $F_0 = 4$

$F(x) = 5 \cdot \frac{x^5}{5} - 2 \cdot \frac{x^6}{6} + C$

$F(0) = 4 = 0 - \frac{1}{3} \cdot 0 + C \rightarrow C = 4$

$F(x) = -\frac{1}{3} x^6 + x^5 + 4$

b) $f(x) = 4 - \frac{2x}{x^2+1}$, $F_0 = 1$

$\int 4\,dx = 4x$ ①

$\frac{2x}{x^2+1} \Rightarrow \ln|2x|$ ②

$x^2 + 1 = u \quad du = 2x + 0 \quad \frac{du}{dx} = \frac{1}{2x}$

$= \frac{1}{u}$

$\int \frac{1}{u}\,dx = \ln|u|$

①② $\rightarrow F(x) = 4x \cdot 0 - \ln|2x| + C$

$F_0 = 1 = 4 \cdot 0 - \ln|2 \cdot 0| + C \rightarrow C = 1$

$F(x) = 4x - \ln|2x| + 1$

Ex3: $f'(x) = \sqrt{2x+1}$ $f0 = 1$

$= (2x+1)^{1/2}$

$(2x)^{\frac{1}{2}} + 1^{1/2}$ ∝

$(2x)^{1/2} = 2^{1/2} \cdot x^{1/2} = \sqrt{2} \cdot x^{1/2} = \sqrt{2} \cdot \frac{2}{3} x^{3/2}$

$= \frac{2\sqrt{2}}{3} x^{\frac{3}{2}}$

$1 = x$

$f(x) = \frac{2\sqrt{2}}{3} x^{3/2} + x + C$

$f0 = 1 = \frac{2\sqrt{2}}{3} 0^{3/2} + 0 + C \rightarrow C = 1$

$f(x) = \frac{2\sqrt{2}}{3} x^{3/2} + x + 1$

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b) $f(x) = x^2 - 2 \quad x \in [-2; 2]$

$\Delta x = 0,5$

Test points:

$f(-1) = -1$ $\quad f(1) = -1$

$f(-0,5) = -1,75$ $\quad f(1,5) = 0,25$

$f(0) = -2$

$S_{sum f} = -7,25$

$A = 0,5 \cdot -7,25 = -3,625$

c) $f(x) = 5 - \frac{1}{2}x \quad 2 \leq x \leq 14$

$\Delta x = 2$

$f(2) = 2$ $\quad f(8) = -1$

$f(4) = 1$ $\quad f(10) = -2$

$f(6) = 0$ $\quad f(12) = -3$

$S_{sum f} = -3$

$A = 2 \cdot -3 = -6$

Ex 6 $\quad A = \sum_{i=1}^{6} f(x_i) \Delta x \quad x_i = a + i\Delta x$

a) $f(x) = x + \frac{1}{x} \quad x \in [1,4]$

$\Delta x = 0,5$

$f(1,5) = 2,166$ $\quad f(3) = 3,333$

$f(2) = 2,5$ $\quad f(3,5) = 3,7857$

$f(2,5) = 2,9$ $\quad f(4) = 4,25$

$S_{sum} \simeq 18,9$

$A = \frac{1}{2} \cdot 18,945 \simeq 9,468$

$\Delta x = 1$

$f(1,5) = \sqrt{1,5} - 2 \approx -0,775$

$f(2,5) = -0,419$

$f(3,5) \approx -0,134$

$f(4,5) \approx 0,121$

$f(5,5) \approx 0,345.$

$A \approx 1 \times (-0,862) = -0,862$

Ex8: $\int_a^b f(x)dx \simeq \frac{b-a}{2}[fa + fb]$

$[2,6] : 40$

$[6,7] : 16$

$[7,10] : 42$

$\int_2^{10} f(x)dx \simeq 98$

Ex11: $I = \int_{-3}^{1} f x\,dx$

$f(x) = \begin{cases} -x-1 & -3 \le x \le 0 \\ -\sqrt{1-x^2} & 0 \le x \le 1 \end{cases}$

$I = \int_{-3}^{0} (-x-1)\,dx + \int_0^1 -\sqrt{1-x^2}\,dx$

$\int_{-3}^{0} (-x-1)\,dx = -\frac{x^2}{2} - x$

$-3 \to 0 : \frac{3}{2}$

$\int_0^1 -\sqrt{1-x^2}\,dx = -\frac{\pi}{4}$

$I = \frac{3}{2} - \frac{\pi}{4}$

Ex 1 :

a) $f(x) = 6x^2 - 2x + 3$

$\int x dx = \frac{x^{n+1}}{n+1} \quad (n \neq -1)$

$6 \cdot \frac{x^3}{3} = 2x^3 \qquad -2 \cdot \frac{x^2}{2} = -x^2 \qquad 3 = 3x$

$F(x) = 2x^3 - x^2 + 3x$

b) $f(x) = \sqrt[4]{x} + \frac{1}{x^2}$

$x^{1/4} = \frac{x^{\frac{5}{4}}}{\frac{5}{4}} = \frac{4}{5} x^{5/4}$

$\frac{1}{x^2} = 1 \cdot \ln|x^2| \qquad \frac{1}{x^2} = x^{-2} = \frac{x}{x} \cdot = -\frac{1}{x}, \quad -\frac{1}{x} = \overline{x^{-2}}$

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

$F = \frac{4}{5} x^{5/4} - \frac{1}{x} + C$

c) $f(x) = \frac{x^2 + x + 2}{x}$

$\frac{x^2}{x} = x = \frac{x^2}{2} \quad 1 = x \quad \frac{2}{x} = 2 \cdot \frac{1}{x} = 2 \cdot (\ln x)$

$F(x) = \frac{x^2}{2} + x + 2\ln|x| + C$

d) $f(x) = 2x(x^2 + 1)$

$2x^3 + 2x$

$2x^3 = 2 \cdot \frac{x^4}{4} = \frac{1}{2} x^4 \qquad 2x = 2 \cdot \frac{x^2}{2} = x^2$

$F(x) = \frac{1}{2} x^4 + x^2 + C$

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b) $f(x) = x^2 - 2$ $[-1; 2]$

$\Delta x = \frac{2-(-1)}{6} = 0,5$

$f(-\frac{1}{2}) = -1,75$ $f(1) = -1$

$f(0) = -2$ $f(1,5) = 0,25$

$f(\frac{1}{2}) = -1,75$ $f(2) = 2$

$A = 0,5 \cdot -4,25 (-4,25) = -2,125$

c) $f(x) = x^2 - 2x$ $[0, 3]$

$\Delta x = 0,5$

$A = 0,5 \cdot 1,75 = 0,875$

Ex 7

a) $f(x) = x + \frac{1}{x}$ $[1,4]$ $n = 6$

$\Delta x = 0,5$

$f(1,25) = 2,05$ $f(2,75) = 03,11$

$f(1,75) = 2,3214$ $f(3,25) = 3,155$

$f(2,25) = 2,6944$ $f(3,75) = 4,01$

$A \simeq 0,5 \times 17,7538 = 8,8769$

b) $f(x) = x^2 - 2$ $[-1, 2]$ $n = 6$

$\Delta x = 0,5$

• $[-1; 0,5]$ $[-0,5; 0]$ $[0; 0,5]$ $[0,5; 1]$ $[1; 1,5]$ $[1,5; 2]$

• trên: $-,75$ ; $-,25$, $,25$, $,75$, $1,25$, $1,75$.

$A = -4,0625$

$S' = V$

$V' = a$

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Ex4: a) $V(t) = \sin t - \cos t$, $S_0 = 0$

$\sin t = -\cos t$ $\quad -\cos t = -\sin t$

$\int V dt = -\cos t + \sin t + C$

$\cos 0 + \sin + C = 0$

$C = 0$

$S(t) = +\sin t - \cos t$

b) $V(t) = 10\sin t + 3\cos t$, $S(\pi) = 0$

$S(t) = -10\cos t + 3\sin t + C$

$-10 \cdot \cos\pi + 3\sin\pi + C = 0$

$10 + 3 \cdot 0 + C =$

$C = -10$

$S(t) = -10\cos t + 3\sin t - 10$

c) $V(t) = 10 + 3t - 3t^2$, $S(2) = 10$

$\int dt = 10t + \frac{3}{2}t^2 - \frac{3}{3}t^3 + C$

$S(2) = 10 = 10 + \frac{3}{2} \cdot 2^2 - \frac{3}{3} \cdot 2^3 + C$

$10 = 10 + 6 - 8 + C \quad -2C = 2$

$S(t) = 10 + \frac{3}{2}t^2 - t^3 + 2$

Ex5

a) $f(x) = \ln + \frac{1}{x}$ $\quad x \in [1;4]$

$Dx = \frac{a-1}{6} = 0,5$

$f1 = 2$

$f1,5 = 2,166$

$f2 = 2,5$

$f2,5 = 2,9$

$+3 = 3,53$

$+3,5 = 3,7857$

$Dx = 16,686$

$\rightarrow A = 0,5 \cdot 16,686 \simeq 8,343$

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