Summary of Chapter 6 Integral Calculus Math 111

Section 6:1

Rule 1: $\int k\, dx$ = k x + C (where k & C are constants) example: $\int 14\, dx$ = 14 x + C

Rule 2: $\int x^n$ dx = $\frac{1}{(n+1)}\, x^{n+1}$ + C (where n ≠ - 1) example: $\int x^3$ dx = $\frac{1}{(3+1)}\, x^{3+1}$ + C = $\frac{1}{4}\, x^4$ + C

Rule 3: $\int c\, f(x)\ dx$ = c $\int f(x) dx$ (where c is a constant) example: $\int 4x\, dx = 4\int x\, dx$ = 4(½)x^2+C=2x^2+C

Rule 4: $\int [\, f(x) \pm g(x)]\ dx = \int f(x)\ dx \pm \int g(x)\ dx$ example: $\int(3x^2 + 2x)$dx = 3(1/3)x^3 + 2(1/2)x^2+C=x^3+x^2+C

Rule 5: $\int e^x\ dx = e^x$ + C example: $\int 9e^x\ dx = 9 \int e^x\ dx = 9e^x$ + C

Rule 6: $\int x^{-1}\, dx = \int \frac{1}{x}$ dx = ln $|x|$ + C (where x ≠ 0) example: $\int (\frac{5}{x})\, dx = 5\int \frac{1}{x}$ dx = 5 ln$|x|$ + C

Section 6.2

Example 1: $\int 4x\, (2x^2 + 1)^7$ dx simplify by letting u = $(2x^2 + 1)$ then du/dx = 4x so du = 4x dx

Substituting above gives a much easier problem: $\int u^7$ du = (1/8) u^8 + C = (1/8) $(2x^2 + 1)^8$ + C

Example 2: $\int \frac{2}{(x-2)}$ dx = $\int 2\, (x-2)^{-1}$ dx simplify by letting u = (x – 2) then du/dx = 1 so du = dx

Substituting above gives $2\int u^{-1}$ du = $2\int(\frac{1}{u})$ du = 2 ln$|u|$ + C = ln u^2 + C = ln $(x-2)^2$ + C

Example 3: $\int 3\, x^2 \sqrt{(x^3 + 2)}$ dx = $\int 3\, x^2\, (x^3 + 2)^{(1/2)}$ dx let u = $(x^3 + 2)$ then du/dx = 3 x^2

du = (3 x^2) dx

gives $\int u^{1/2}$ du = $(\frac{1}{(\frac{1}{2}+1)})$ $u^{3/2}$ + C = $\frac{1}{\frac{3}{2}}$ $u^{3/2}$ + C = $\frac{2}{3}$ $u^{3/2}$ + C = $\frac{2}{3}$ $(x^3 + 2)^{3/2}$ + C

Example 4: $\int x^2\ (2x^3 + 3)^4$ dx let u = $(2x^3 + 3)$ so du = 6 x^2 du so $(\frac{1}{6})$ du = x^2 dx

Substituting simplifies to: $\frac{1}{6} \int u^4$ du = $\frac{1}{6}$ $(\frac{1}{5})$ u^5 + C = $\frac{1}{30}$ $(2x^3 + 3)^5$ + C