§5.7: SUBSTITUTION

Math 1910

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ONE PAGE REVIEW

- Try the **Substitution Method** when the integrand has the form $f(u(x))u'(x)$. If F is an antiderivative of f, then

$$\int f(u(x))u'(x)\,dx = \boxed{}^{(1)} + C$$

- The differential of $u(x)$ is related to dx by $du = \boxed{}^{(2)}$.
- The **Change of Variables Formula** says that
  - For indefinite integrals: $\int f(u(x))u'(x)\,dx = \boxed{}^{(3)}$
  - For definite integrals: $\int_a^b f(u(x))u'(x)\,dx = \boxed{}^{(4)}$

PROBLEMS

(1) Evaluate the indefinite integral.

(a) $\int x(x+1)^9\,dx$

(b) $\int \sin(2x-4)\,dx$

(c) $\int \frac{x^3}{(x^4+1)^4}\,dx$

(d) $\int \sqrt{4x-1}\,dx$

(e) $\int x\cos(x^2)\,dx$

(f) $\int \sin^5 x\cos x\,dx$

(g) $\int \sec^2 x\tan^4 x\,dx$

(h) $\int \frac{dx}{(2+\sqrt{x})^3}$

(2) Evaluate the definite integral.

(a) $\int_0^1 \frac{x}{(x^2+1)^3}\,dx$

(b) $\int_{10}^{17} (x-9)^{-2/3}\,dx$

(c) $\int_{-8}^{8} \frac{x^{15}}{3+\cos^2 x}\,dx$

(d) $\int_0^{\pi/2} \sec^2(\cos\theta)\sin\theta\,d\theta$

(e) $\int_{-4}^{-2} \frac{12x\,dx}{(x^2+2)^3}$

(f) $\int_1^8 \sqrt{t+8}\,dt$

(g) $\int_0^{\pi/3} \frac{\sin\theta}{\cos^{2/3}\theta}\,d\theta$

(h) $\int_{-2}^{4} |(x-1)(x-3)|\,dx$

(3) Evaluate the indefinite integral

$$\int \tan x\sec^2 x\,dx$$

in two ways: first using $u=\tan x$ and then using $u=\sec x$. What's going on here?