SECTION 5-5: SUBSTITUTION (DAY 1)

1. Compute $\int e^{4x-9}\,dx$ $= \int e^u \cdot \frac{1}{4} \cdot du = \frac{1}{4}e^u + C$

let $u = 4x-9$

$du = 4\,dx$

$\frac{1}{4}\,du = dx$

$= \frac{1}{4}e^{4x-9} + C$

2. Compute $\int x\sin(x^2+1)\,dx$ $= \frac{1}{2}\int \sin u\,du = -\frac{1}{2}\cos u + C$

let $u = x^2+1$

$du = 2x\,dx$

$\frac{1}{2}\,du = x\,dx$

$= -\frac{1}{2}\cos(x^2+1) + C$

3. Compute $\int \frac{e^{\sqrt{x}}}{\sqrt{x}}\,dx.$ $= 2\int e^u\,du = 2e^u + C$

let $u = x^{1/2}$

$du = \frac{1}{2}x^{-1/2}\,dx$

$2\,du = \frac{dx}{\sqrt{x}}$

$= 2e^{\sqrt{x}} + C$

4. Compute $\int_1^4 \frac{e^{\sqrt{x}}}{\sqrt{x}}\,dx.$ $= 2e^{\sqrt{x}}\Big|_1^4 = 2\left(e^{\sqrt{4}} - e^{\sqrt{1}}\right)$

$= 2(e^2 - e)$

5. Compute $\int \frac{\arctan(x)}{1+x^2}\,dx$

$= \int u\,du = \frac{1}{2}u^2 + C$

let $u = \arctan x$

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

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

6. Compute $\int \frac{x^3}{\sqrt{1-x^4}}\,dx$ $= \int x^3(1-x^4)^{-1/2}dx = -\frac{1}{4}\int u^{-1/2}du$

let $u = 1-x^4$

$du = -4x^3dx$

$-\frac{1}{4}du = x^3dx$

$= -\frac{1}{4}\cdot 2\left(u^{1/2}\right) + C$

$= -\frac{1}{2}\sqrt{1-x^4} + C$

7. Compute $\int \frac{x}{\sqrt{1-x^4}}\,dx.$ $= \int \frac{x\,dx}{\sqrt{1-(x^2)^2}} = \frac{1}{2}\int \frac{du}{\sqrt{1-u^2}}$

let $u = x^2$

$du = 2x\,dx$

$\frac{1}{2}du = x\,dx$

$= \frac{1}{2}\arcsin(u) + C$

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