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## The Substitution Rule

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**Solutions should show all of your work, not just a single final answer.**

1. Evaluate each of the following indefinite integrals using substitution, expressing your final answer in terms of  $x$ .

(a)  $\int x^2 \sin(x^3) dx$

(b)  $\int x\sqrt{4x+1} dx$

(c)  $\int \frac{x}{x^2+1} dx$

(d)  $\int \frac{1}{x \ln x} dx$

2. Rewrite each of the following definite integrals in  $x$  as a definite integral in the indicated new variable  $u$ . **Do not evaluate** the new definite integral.

(a)  $\int_0^1 x^2(1+2x^3)^5 dx$  in terms of  $u = 1 + 2x^3$

(b)  $\int_0^{\pi/3} \frac{\sin x}{\cos^2 x} dx$  in terms of  $u = \cos x$

(c)  $\int_0^{\pi/3} \sin x \cos x dx$  in terms of  $u = \cos x$

(d)  $\int_2^3 xe^{-x^2} dx$  in terms of  $u = x^2$

3. When  $u = \sqrt{x}$ ,  $\int_0^4 f(\sqrt{x}) dx = \int_0^2 2uf(u) du$ .