

MATH 136 – Calculus 2  
Integration By Substitution Practice  
September 16, 2016

Each of the following integrals can be done by the method of  $u$ -substitution:

1. Determine the appropriate function  $u$ ,
2. Compute  $du$ ,
3. Change the integral to an equivalent form in the new variable  $u$ . If it is a definite integral, you can convert the limits of integration as well.
4. Integrate, then
5. Resubstitute  $u$  to express the answer in terms of the original variable (indefinite integral cases), or evaluate (definite integral cases).

- $\int x\sqrt{4x^2 + 16} dx$

- $\int_0^\pi \cos \theta e^{1+\sin \theta} d\theta$

- $\int_{\pi/4}^{\pi/2} \cos^3(4\theta) \sin(4\theta) d\theta$

- $\int \frac{1}{\sqrt{1-4x^2}} dx$

- $\int \frac{x}{\sqrt{1-4x^2}} dx$  (Note the difference with the previous one!)

- $\int \frac{1}{x(\ln(x))^p} dx$  (the number  $p > 0$  is a constant; your answer should depend on  $p$  and there should be two separate cases.)

- $\int x^3 \sec(x^4) \tan(x^4) dx$

- $\int \frac{\cos(\sqrt{y})}{\sqrt{y}} dy.$

- $\int x^3 \sqrt{4x^2 + 16} dx$  (More challenging!)