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

- $\int x\sqrt{4x^2+16}\,dx$. Let $u = 4x^2+16$; Answer $= \frac{1}{12}(4x^2+16)^{3/2}+C$.
- $\int_0^{\pi} \cos\theta e^{1+\sin\theta}\,d\theta$. Let $u = 1+\sin\theta$; Answer $= 0$.
- $\int_{\pi/4}^{\pi/2} \cos^3(4\theta)\sin(4\theta)\,d\theta$. Let $u = \cos(4\theta)$; Answer $= 0$.
- $\int \frac{1}{\sqrt{1-4x^2}}\,dx$. Let $u = 2x$; Answer $= \frac{1}{2}\sin^{-1}(2x)+C$.
- $\int \frac{x}{\sqrt{1-4x^2}}\,dx$. Note the difference with the previous one! Let $u = 1-4x^2$, Answer $= -\frac{1}{4}(1-4x^2)^{1/2}+C$.
- $\int \frac{1}{x(\ln(x))^p}\,dx$. The number $p > 0$ is a constant; your answer should depend on p and there should be two separate cases: Let $u = \ln(x)$, so the integral is

  $$\frac{(\ln(x))^{-p+1}}{-p+1}+C$$

  if $p \neq 1$ and

  $$\ln(\ln(x))+C$$

  if $p = 1$.
- $\int x^3\sec(x^4)\tan(x^4)\,dx$. Let $y = x^4$. The answer is $\frac{1}{4}\sec(x^4)+C$.
- $\int \frac{\cos(\sqrt{y})}{\sqrt{y}}\,dy$. Let $u = \sqrt{y}$. The answer is $= 2\sin(\sqrt{y})+C$.
- $\int x^3\sqrt{4x^2+16}\,dx$. More challenging! Letting $u = 4x^2+16$, the $x^3 = \frac{u-16}{4}\cdot\frac{1}{8}du$ and the integral is

  $$= \frac{1}{80}(4x^2+16)^{5/2} - \frac{1}{3}(4x^2+16)^{3/2}+C.$$