

Math 101 – WORKSHEET 6
SUBSTITUTION

Theorem (Substitution). $\int f'(g(x))g'(x) dx = f(g(x)) + C$. Equivalently, $\int f(g(x))g'(x) dx = \int f(u) du$ where $u = g(x)$.

- (1) Evaluate the integrals
- (a) $\int \sin x \cos x dx =$
(hint: use $u = \sin x$)

Problem. It's easy to check that $(-\frac{1}{4} \cos(2x))' = \frac{1}{2} \sin(2x) = \frac{1}{2} \cdot 2 \sin x \cos x = \sin x \cos x$. How is that possible?

(b) (Final, 2014) $\int \cos^3 x \sin^4 x dx =$

(c) (Final, 2013) $\int_1^3 (2x - 1)e^{x^2 - x} dx =$

(d) (Final, 2012) $\int_0^3 (x + 1)\sqrt{9 - x^2} dx =$