SECTION 5.5: SUBSTITUTION (I.E. UNDOING THE CHAIN RULE)

1. (like #259 in hmwk)

    (a) Verify that the formula is correct: $\displaystyle\int \frac{2x}{\sqrt{x^2-1}}\,dx = 2\sqrt{x^2-1}+C$

    (b) Use the substitution $u = x - 1$ to rewrite *the entire integral* in terms of u. Then integrate the integral with the new variables.

2. Explain why the formula is not correct: $\displaystyle\int \sqrt{x^2+1}\,dx = \frac{1}{3}(x^2+1)^{3/2}+C$

3. Goals: (a) Practice u-substitution (b) Practice *sophisticated* u-substitution (c) Practice substitution with both indefinite and definite integrals (d) Develop intuition about how to choose u.

4. $\displaystyle\int t^3 \cos(t^4 + 1)\,dt$

5. $\displaystyle\int \sin^2(x) \cos(x)\,dx$

1

6. $\displaystyle\int (x-1)(x^2-2x)^{10}\ dx$

7. $\displaystyle\int \frac{dx}{(8-5x)^3}$

8. $\displaystyle\int_0^2 \frac{x}{x^2+4}\ dx$

9. $\displaystyle\int_0^{\pi/4} \tan^3(\theta)\sec^2(\theta)\ d\theta$

10. $\displaystyle\int (x^4-5)f^{1/3}x^7\ dx$

11. What is wrong with the calculation

$$\int_{-1}^1 -x^{-2}dx = x^{-1}\big|_{-1}^1 = \frac{1}{1} - \frac{1}{-1} = 2.$$