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

Goals: (i) Practice u-substitution (ii) Practice sophisticated u-substitution (iii) Practice substitution with both indefinite and definite integrals (iv) Develop intuition about how to choose u.

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

(b) Use the substitution $u = x^2 - 1$ 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: $\int \sqrt{x^2+1} \, dx = \frac{1}{3} (x^2+1)^{3/2} + C$
- 3. $\int t^3 \cos(t^4 + 1) dt$

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

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

6.
$$\int \sin\left(\frac{\pi x}{4}\right) dx$$

7.
$$\int_0^1 (x-1)(x^2-2x)^{10} dx$$

8.
$$\int_0^{\pi/4} \tan^3(\theta) \sec^2(\theta) d\theta$$

9.
$$\int (x^4 - 5)^{1/3} x^7 dx$$