

Problem Sheet: Chain Rule and Substitutions 1

Jeffrey Thompson

January 2, 2026

0.1 Practice: Chain Rule and Substitution

Exercise 1. Differentiate the following functions.

1. $\ln(5x)$
2. e^{-20x^2}
3. $\sin(16x^3)$
4. $\cos\left(\frac{2}{x}\right)$

Exercise 2. Evaluate the following indefinite integrals.

1. $\int \sin^2 x \, dx$
2. $\int \cos^2 x \, dx$

Exercise 3. For each integral below, state a suitable substitution before evaluating the indefinite integral.

1. $\int \ln(5x) \, dx$
2. $\int e^{-20x} \, dx$
3. $\int \sin(16x) \, dx$
4. $\int \cos(2x) \, dx$