

1. [20 points] Derive the formula for integration by parts.
2. [20 points] Review Problem: Derive the product formula for derivatives.

3. [60 points] Do the following integrals.

a. $\int \cos^3(x) \sin(x) \, dx$

b. $\int \sec^2(2x) \tan(2x) \, dx$

c. $\int \frac{e^x - e^{-x}}{e^x + e^{-x}} \, dx$

d. $\int \frac{dx}{\sqrt{4x^2 + 1}}$

e. $\int \frac{dt}{(t^2 + 1)^{3/2}}$

f. $\int \frac{\sqrt{1-x^2}}{x^4} dx$