

Find and correct the mistakes in the following “solutions” to these integration problems.

a) $\int \sin 5x \, dx; \quad u = 5x, \, du = 5dx$

$$\int \sin 5x \, dx = \int 5 \sin u \, du = -5 \cos u + C = -5 \cos 5x + C$$

b) $\int \frac{\cos x}{1 + \sin^2 x} \, dx; \quad u = \sin x, \, du = \cos x \, dx$

$$\int \frac{\cos x}{1 + \sin^2 x} \, dx = \int \frac{du}{1 + u^2} = \ln |1 + u^2| + C = \ln |(1 + \sin^2 x)| + C$$

c) $\int_0^1 (4x + 1)(2x^2 + x)^{\frac{5}{3}} \, dx; \quad u = 2x^2 + x, \, du = 4x + 1$

$$\int_0^1 (4x + 1)(2x^2 + x)^{\frac{5}{3}} \, dx = \int_0^1 u^{\frac{5}{3}} \, du = \left[\frac{3}{8} u^{\frac{8}{3}} \right]_0^1 = \frac{3}{8}$$