Consider the indefinite integral

$$\int \sin^3(x)\ dx$$

1. Explain why the substitution $u = \sin(x)$ will not work to help evaluate the given integral.

2. Recall the Fundamental Trigonometric Identity, which states that $\sin^2(x) + \cos^2(x) = 1$. By observing that $\sin^3(x) = \sin^2(x)\sin(x)$, use this identity to rewrite the integrand as the product of $\sin(x)$ and another function.

3. Explain why the substitution $u = \cos(x)$ provides a possible way to evaluate the integral in (b).

4. Use the work in (a)-(c) above to evaluate the integral $\int \sin^3(x)\ dx$.

5. Use a similar approach to evaluate $\int \cos^3(x)\ dx$.