1. For the following integrals, decide whether to use $u$-substitution or integration by parts to evaluate the integral. Then, evaluate the integral.

(a) $\int x \cos(x^2) \, dx$

(b) $\int x^2 \cos x \, dx$

(c) $\int x \sqrt{x^2 + 1} \, dx$

(d) $\int \sin x \cos x \, dx$
2. Use a \( u \)-substitution followed by integration by parts to evaluate the following integral:

\[
\int_{0}^{4} e^{\sqrt{x}} \, dx
\]

3. Evaluate \( \int e^{2x} \cos x \, dx \)
4. The function \( f(x) = e^{-x^2} \) does not have an antiderivative in terms of elementary functions. Instead a new function \( \text{erf}(x) \) is used:

\[
\int e^{-x^2} \, dx = \frac{\sqrt{\pi}}{2} \text{erf}(x) + C
\]

Evaluate the following integral using the function \( \text{erf}(x) \) as part of your answer.

\[
\int \frac{e^{-x}}{\sqrt{x}} \, dx
\]

5. Evaluate \( \int_{-3}^{3} \sqrt{9-x^2} \, dx \). \textit{(Hint: Don’t try to find the antiderivative of the \( \sqrt{9-x^2} \), instead try to determine the value geometrically by looking at the graph of the function \( f(x) = \sqrt{9-x^2} \) from \(-3 \) to \(3 \).)