INTEGRATION

Tutorial 15.1. Antiderivatives
Determine the following indefinite integrals:
(a) \( \int (2y^2 + 5y + 3)\,dy \)
(b) \( \int (\sqrt{3u} + \frac{1}{u^2} - \frac{5}{u})\,du \)

Tutorial 15.2. Substitution
Use substitution to determine the following integrals:
(a) \( \int \frac{5\,du}{\sqrt{5u^2 - 2}} \)
(b) \( \int z\sqrt{4z^2 - 5}\,dz \)
(c) \( \int te^{-t^2}\,dt \)

Tutorial 15.3. Area and definite integrals
Using geometry, find the value of the integral
\[ \int_{-4}^{0} \sqrt{16 - x^2}\,dx \]

Tutorial 15.4. The fundamental theorem of calculus
(a) Compute the following integral:
\[ \int_{-2}^{-3} \left(2e^{-0.1y} + \frac{3}{y}\right)\,dy \]
(b) The velocity \( v \) of blood in a blood vessel is given by
\[ v(r) = k(R^2 - r^2), \]
where \( r \) is the distance from the center of the blood vessel, \( R \) is the radius of the blood vessel, and \( k \) is a constant. The total blood flow through the blood vessel is given by
\[ Q(R) = \int_{0}^{R} 2\pi vr\,dr. \]
Give the formula for \( Q \) in terms of \( R \).