1. (16 pts.) Find the locations and values of all absolute maxima and minima for
\[ f(x) = x^3 - 2x^2 + 5, \quad \text{on } [-1, 1]. \]

2. (12 pts.) Find \( \frac{dy}{dx} \) if
\[ \frac{x}{y} - 4y = 3x \]
and find the equation of the tangent line to the graph at the point \((x, y) = (1, -1)\).
3. (8 pts.) Evaluate $dy$ if

$$y = \frac{2x - 1}{x + 3}, \quad x = 1, \quad \Delta x = \frac{1}{8}.$$ 

4. (16 pts.) Find the following indefinite integrals (you are not required to simplify):

$$\int x^{\frac{3}{2}} - 2x^{-\frac{1}{2}} \, dx$$

$$\int z e^{2z^2} \, dz$$

$$\int \sin(5w) + 2 \cos(2w) \, dw$$

$$\int \frac{t - 1}{t^2 - 2t + 2} \, dt$$
5. (16 pts.) Find the following definite integrals (you are not required to simplify):

\[ \int_1^2 3x^3 + x^{-2} \, dx \]

\[ \int_{-1}^1 e^{-3z} \, dz \]

\[ \int_0^1 (w^2 - w + 1)^3(2w - 1) \, dw \]

\[ \int_0^\pi 2 \tan(t/2) \, dt \]

6. (10 pts.) Find \( \frac{dy}{dt} \) if

\[ y \ln(x) + 2xe^y = 2, \text{ with } \frac{dx}{dt} = 1, x = 1, y = 0. \]
7. (10 pts.) The rate of infection of a disease (in people per month) is given by the function

\[ I'(t) = \frac{100t}{t^2 + 1}, \]

where \( t \) is the time in months since the disease broke out. Find the total number of infected people over the first four months of the disease.

8. (12 pts.) Find the area of the region enclosed by the two curves \( f(x) = 5 - x^2 \) and \( g(x) = x^2 - 3 \) for \( x \in [0, 4] \).