1. Let a function $f$ be defined by

$$f(x) = \log_{10} \sqrt{x^4 - 16}.$$ 

On which intervals is $f$ one-to-one? For each of these intervals, find the inverse function of $f$.

2. If $\log_5 100 = a$, find $\log_{100} 5$.

3. Solve the initial value problem

$$\frac{dy}{dx} = \frac{1}{x^2 + 4}, \quad y(0) = 2.$$ 

4. Find the derivative of $\log_2 (\sec^{-1} x)$.

5. Simplify the expression

$$\ln \sqrt{x} + \ln(x\sqrt{x}) + \ln \left(\frac{5}{x^2}\right) + \log_2(32x).$$ 

For which values of $x$ is this expression defined?

6. Find the indefinite integral

$$\int \frac{dx}{\sqrt{16 + 6x - x^2}}.$$ 

7. Evaluate the definite integral

$$\int_{-3\sqrt{2}}^{-2\sqrt{3}} \frac{dx}{x\sqrt{x^2 - 9}}.$$ 

8. If $f(x) = x^5 + 2x - 8$ and $g = f^{-1}$, find $g'(-8)$. 