1. Calculate the following integrals.

   (a) \( \int \left( 5x^3 - \frac{1}{x} + \sqrt{x} \right) \, dx \)

   (b) \( \int \tan^2 x \, dx \)

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

   (d) \( \int \cos(2x) \, dx \)

   (e) \( \int \frac{e^x}{1 + e^x} \, dx \)

   (f) \( \int (x^2 - 5x)^4(2x - 5) \, dx \)

   (g) \( \int \sin x \sqrt{\cos x} \, dx \)

2. The rate of infection of a disease (in people per month) is given by the function

   \[ r(t) = \frac{100t}{t^2 + 1}, \]

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

3. Evaluate \( \int_{-2}^{2} \sqrt{4 - x^2} \, dx \) by interpreting it as the area of a familiar region.