

Name: _____

VIP ID: _____

- Write your name and VIP ID in the space provided above.
 - The test has three (3) pages, including this one.
 - Credit for each problem is given in parentheses at the right of the problem number.
 - No books, notes or scratch paper may be used on this test.
 - An approved calculator may be used on this test.
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Problem 1 (10 + 15 pts). Evaluate the following integrals.

(a) $\int_0^4 \ln(y^2 + 1) dy =$

(b) $\int_{10}^{103} 9xe^{x^2} dx =$

Problem 2 (25 pts). What is the average value of $f(x) = \sqrt{9 - x^2}$ over the interval $0 \leq x \leq 3$? Round your answer to two decimal places.

Problem 3 (25 pts). For a product, the demand curve is $p = 53 - q^2$ and the supply curve is $p = 3 + q^2$, where q is quantity and p is price in dollars per unit. Find the producer surplus when the market is in equilibrium (round your answer to the nearest dollar).

Problem 4 (25 pts). After a foreign substance is introduced into the blood, the rate at which antibodies are made is given by

$$r(t) = \frac{t}{t^2 + 1} \text{ thousands of antibodies per minute,}$$

where time t is in minutes. Assuming there are no antibodies present at time $t = 0$, find the total quantity of antibodies in the blood at the end of 7 minutes.