

Country: _____

Reference Number: _____

Name: _____

2010 Math Examination for the Japan-IMF Scholarship Applicants
(50 minutes)

Note:

There are 19 total points. No calculators are allowed.

Show all your work including calculation or other memo in the margin of this paper or on answer sheets.

Part 1 (one point each)

1. Compute: $(0.1 - 0.2) \times 0.3 - (0.4 - 0.5)$

Answer:

2. Compute: $0.04 / 0.0016$

Answer:

3. Simplify the expression: $x + \frac{x}{3} - \frac{x}{5} + \frac{2x}{7}$

Answer:

4. Simplify the expression: $e^{c \ln[(a+b)^{1/2}]}$

Answer:

5. Compute:

$$\sum_{x=1}^{100} x$$

Answer:

Part 2 (two points each)

6. Solve for x and y in the following equations: $\begin{cases} 10x - 3y = 1 \\ 2x + 9y = 5 \end{cases}$

Answer:

7. Obtain for the row vector **a** and the column vector **b**, below, the products **ab** and **ba**:

$$\mathbf{a} = [1 \ 2 \ 0], \quad \mathbf{b} = \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}$$

Answer:

Part 3 (two points each)

8. The number of female students increased by 15% from the last year, while the male students decreased by 10% from the last year. As a result, the total number of students did not change from the last year. What is the ratio of the female students to the total number of students in this year?

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9. A cigarette tax yields revenue $R(t) = 50 + 25t - 75t^2$. What tax rate maximizes revenues?

Answer:

10. Find the derivative of $h(x) = \frac{\ln x}{x^2}$.

Answer:

Part 4 (two points each)

11. Evaluate the following integral: $\int_0^3 (4x + 10) dx$ **Answer:**

12. Use the technique of integration by parts to evaluate the following integral: $\int x \ln x dx$

Answer: