Basic Mathematics Aptitude Test

(Full score: 40)

Please Note:

- You have 60 minutes to complete.
- No calculators are allowed.
- Please show all your work and write your answers in the designated space.

Thank you.

Country:_____

Reference Number:_____

Name:_____

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Reference Number: _____ Country: _____

Name: _____

(Please show all your work here and write your answers in the designated space.)

[Part 1] (1 point for each question) Answer the following questions:

1. Solve the following system of linear equation

$$\begin{cases} 2x - 3y = -19 \\ 4x + 5y = 17 \end{cases}$$

Answer: _____

2. Calculate the following

$$(256)^{-1/4} \times \frac{2}{3} + \frac{5}{2}$$

Answer: _____

3. Calculate the following expression.

$$\log_6 3 + \log_6 9 + \log_6 2 + \log_6 4$$

Answer: _____

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Name: _____

(Please show all your work here and write your answers in the designated space.)

4. Solve for *x* when:

$$\ln\left(\frac{1}{e^{1.2x} \times e^{0.8x} \div e^{x}}\right) = x - 1$$

Answer: _____

5. When $\frac{a}{2} = \frac{b}{4}$, calculate the following expression.

$$\frac{2a + b}{a - 3b}$$

Answer: _____

[Part 2] (2 point for each question) Answer the following questions:

1. Find what values of x satisfy the following inequality.

$$3x - 4 < 4x - 3 < 2x + 3$$

Answer: _____

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Name: _____

(Please show all your work here and write your answers in the designated space.)

2. Deduce the equation of a line which is parallel to $2x - 3y = 0$ and passes through the point $(1, -2)$.

Answer: _____

3. Find what value of *x* satisfies the following equation.

$$4^x + 2^x = 6$$

Answer: _____

4. Solve the following equation.

$$(2x - 1)(x - 2) = 5$$

Answer: _____

5. Find x satisfying the following equation.

$$\sum_{i=0}^{2} (i - 2)x^{i-1} = 1$$

Answer: _____

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Name: _____

(Please show all your work here and write your answers in the designated space.)

[Part 3] (3 point for each question) Answer the following questions:

1. Find the first derivative of the function below:

$$y = (x - 1)(2x^2 - x + 3)$$

Answer: _____

2. Find the first order derivative of the function below.

$$f(x) = \frac{2x - 1}{x - 1}$$

Answer: _____

3. Evaluate the following integral.

$$\int_0^1 (x + x^2 + e^{3x})dx$$

Answer: _____

Reference Number: _____ Country: _____

Name: _____

(Please show all your work here and write your answers in the designated space.)

4. Differentiate the following function.

$$\ln(e^x - e^{-x})$$

Answer: _____

5. An individual consumes x_1 unit of goods 1 and x_2 unit of goods 2. Given the price of each goods, the consumer maximizes the utility $u(x_1, x_2)$ within his income. Find the optimal consumption bundle (x_1^*, x_2^*) which solves the following utility maximization problem:

$$\text{maximize } u(x_1, x_2) = ln(x_1) + ln(x_2)$$
$$\text{subject to } x_1 + 4x_2 = 16$$

Answer: _____

[Part 4] Answer the following questions:

1. Answer the following questions:
   (a) **[2 points]** Evaluate the following sum.

$$\sum_{k=1}^{\infty} 0.4^k$$

Answer: _____

Reference Number: _____ Country: _____

Name: _____

(Please show all your work here and write your answers in the designated space.)

(b) **[3 points]** Evaluate the following sum.

$$\sum_{k=1}^{4}(2^k - 3k)$$

Answer: _____

2. Given two matrices **A** and **B** below, answer the following two sub-questions.

$$A = \begin{bmatrix} -1 & 2 \\ 3 & -4 \end{bmatrix}, B = \begin{bmatrix} 0 & 2 & -1 \\ 2 & -2 & 5 \end{bmatrix},$$

(a) **[2 points]** Find the determinant of **A**.

Answer: _____

(b) **[3 points]** Compute the product matrix $\mathbf{A^{-1}B}$.

Answer: _____