Basic Mathematics Aptitude Test

(Full Score: 35 points)

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.

Name: _____

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

[Part 1] (1 point/question) Calculate the following:

1 $0.02 \div 0.05 \times 0.1$

Answer: _____

2 $\left(\frac{1}{4} - \frac{1}{8} + \frac{1}{12}\right) \times 12$

Answer: _____

3 $\left(\frac{1}{4} \times \frac{1}{16}\right)^{1/2}$

Answer: _____

4 $3\ln(k) + \ln\left(\frac{1}{k}\right)^3$

Answer: _____

5 $\ln(e^{0.05} \times e^{0.08})$

Answer: _____

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

[Part 2] (2 points/question) Answer to the following questions:

1. Find what values of x satisfy $4x-7<x+5$ and $2x+5>x-5$

Answer: _____

2. Solve the following equation. $4x-10=2-3x$

Answer: _____

3. Solve the following simultaneous equations.

$$\begin{cases} 5x-2y=9 \\ 3x+8y=10 \end{cases}$$

Answer: _____

4. Solve the following equation: $y^2-4y-12=0$

Answer: _____

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

[Part 3] (3 points/question) Answer to the following questions:

1. Differentiate the function below:

$f(x) = 5x^4 + 4x^3 + 3x^2 + 1$

Answer: _____

2. Find the partial derivative $\partial^2 f / \partial x \partial y$ when $f(x, y) = (4x+1)^2 (3y+2)^2$

Answer: _____

3. Evaluate the following integral:

$\int_{-1}^{1} (3x^2 + 4x + 1) dx$

Answer: _____

4. By producing and selling Q units of some commodity, a firm earns total revenue $R(Q) = -5Q^2 + 8Q$ and incurs a constant cost $C(Q) = 3Q^2$ .What production level of Q would maximize this firm's profits (namely, $R(Q) - C(Q)$)?

Answer: _____

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

[Part 4] (5 points/question) Answer to the following questions:

1. Evaluate the following sum:

$$\sum_{k=1}^{\infty}(0.5)^k$$

Answer: _____

2. Compute the product matrix **AB** of two matrices **A** and **B**.

$$A=\begin{pmatrix}4 & 0 & 0\\ 0 & 4 & 0\\ 0 & 0 & 4\end{pmatrix},\quad B=\begin{pmatrix}1 & 2 & 3\\ 4 & 5 & 6\\ 7 & 8 & 9\end{pmatrix}$$

Answer: _____