

## Exam 3

Student Name: \_\_\_\_\_

Student ID#: \_\_\_\_\_

Each problem is worth 5 points. Give a complete solution to receive the full credit!

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1. Which of the following logarithms are defined?

1.  $\log_{0.1}(\ln 0.5)$

2.  $\log_{0.000001} 3^{-7}$

3.  $\log_3 3$

4.  $\log_{10^{-3}} \pi$

5.  $\log_1 0.1$

2. If  $\log_a b = 5$ ,  $a > 0$ ,  $a \neq 1$ ,  $b > 0$ , and  $\log_3 a = 4$  find the value of  $\log_a 9b$ .

3. Evaluate:

(a)  $2013^{\log_{2013} \pi}$

(b)  $\ln e^{2 \cdot 10^{-17}}$

4. Let  $g(m) = m + a$ . Find  $a$  so that  $(g + (g \circ g))(5) = 3$ .

5. Solve the following exponential equation:

$$700 = 400 + e^{x^2-2}.$$

6. Solve the following logarithm equation:

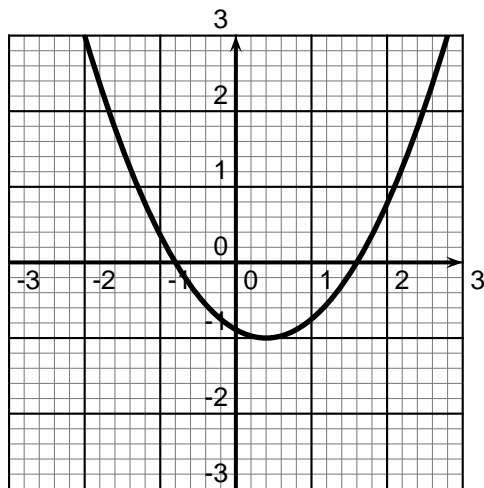
$$\ln(x - 5) + \log(3 - x) = 9.$$

7. The function  $f$  is defined by

$$f(x) = \begin{cases} 3x - 1, & -3 \leq x < 0 \\ x^2 + 5, & 0 \leq x < 2 \\ -x, & 2 \leq x \leq 4 \end{cases}$$

Decide if the function is one-to-one. Make sure you justify your answer!

8. For the graph of the quadratic function  $j(x)$  given below, determine:
1. If the parabola is concave up or concave down.
  2. If the parabola has a maximum or a minimum.
  3. The equation of the axis of symmetry.
  4. The coordinates of the vertex.
  5. Estimated coordinates of the horizontal and vertical intercepts.



9. Find the domain over the field of real numbers of the function:

$$f(z) = \log \frac{z^2 - 1}{7 - z}$$

10. Market research suggests that if a particular item is priced at  $x$  dollars, then the weekly profit  $P(x)$ , in thousands of dollars, is given by the function

$$P(x) = -10 + \frac{13}{2}x - \frac{1}{2}x^2.$$

1. What price range would yield a lost for this item?
2. What is the maximum profit?