

**MASSACHUSETTS MATHEMATICS LEAGUE**  
**CONTEST 3 - DECEMBER 2015**  
**ROUND 4 ALG 2: LOG & EXPONENTIAL FUNCTIONS**

**ANSWERS**

A) \_\_\_\_\_ : \_\_\_\_\_

B) ( \_\_\_\_\_ , \_\_\_\_\_ )

C) ( \_\_\_\_\_ , \_\_\_\_\_ )

A) Given:  $\log_3(\log_3 3x) = 2 = \log_9(3y)$ .

Compute the ratio  $y : x$ .

B) The graph of  $y = \log_8 x$  has an  $x$ -intercept at  $(1, 0)$ , but no  $y$ -intercept. We say the graph is asymptotic to the  $y$ -axis, that is, the distance between points on the graph and the  $y$ -axis get arbitrarily small, but never actually reach zero. Compute the coordinates of point  $P$  on the graph of  $y = \log_8 x$  which is 0.25 units from the  $y$ -axis.

C) Given  $\log_{14}(0.125) = W$ ,  $\log_8(49)$  may be expressed in terms of  $W$  as  $m\left(\frac{W+b}{W}\right)$ ,  
for constants  $m$  and  $b$ , where  $b > 0$ . Compute the ordered pair  $(m, b)$ .