MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 6 – MARCH 2008 SOLUTION KEY

Round 1

A) The slope of the first line is 2 → slope of the second line = $-\frac{A}{B} = -\frac{1}{2}$ → $B = 2A$

Thus, $A\,(\frac{1}{2}) + 2A(2) = -9$ → $A = -2$ → $(A, B) =$ **(-2, -4)**

B) Determining the determinant using the weaving technique,

$$\begin{matrix} 1 & x & -3 & 1 & x \\ 2 & 0 & -1 & 2 & 0 \\ -3 & 2x-3 & x & -3 & 2x-3 \end{matrix} \rightarrow [1(0)x + x(-1)(-3) + -3(2)(2x\text{-}3)] - [-3(0)(-3) + (2x\text{-}3)(-1)(1) + x(2)(x)]$$

→ $3x - 12x + 18 - 2x^2 + 2x - 3 = -7$ → $2x^2 + 7x - 22 = (2x + 11)(x - 2) = 0$ → **-11/2, +2**

C) Let (x, y, z) denote the cost of (pizza, sub, spaghetti)

Then (a) $3x + 2y = 4 + 5z$ → $3x + 2y - 5z = 4$,

(b) $2(y + z) = 3x - 2$ → $-3x + 2y + 2z = -2$

(c) $x = y + z - 3$ → $x - y - z = -3$

(a) – (b) → $4y - 3z = 2$ → $4y - 3z = 2$

3(c) + (b) → $-y - z = -11$ → $-4y - 4z = -44$ → $-7z = -42$ → $z = 6$, $y = 5$ and $x = 8$ → **($8, $5, $6)**