MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 4 - JANUARY 2009 SOLUTION KEY

Round 2

A) $(2x-1)(x+2) = 25 \rightarrow 2x^2 + 3x - 27 = 0 \rightarrow (2x+9)(x-3) = 0 \rightarrow x = \underline{\mathbf{-\frac{9}{2}}}$

B) $12x^5 - 36x^3 = 46x^4 \rightarrow 2x^3(6x^2 - 23x - 18) = 0 \rightarrow 2x^3(3x+2)(2x-9) \rightarrow x = \underline{\mathbf{0, -\frac{2}{3}, \frac{9}{2}}}$

C) $72x^3 - 4x^2 + 9 - 32x^5 = 8x^3(9-4x^2) + (9-4x^2) = \left(8x^3+1\right)\left(9-4x^2\right)$

As the sum of perfect cubes and the difference of perfect squares, this product factors to $\underline{\mathbf{(2x+1)(4x^2-2x+1)(3+2x)(3-2x)}}$