MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 6 – MARCH 2009 SOLUTION KEY

Round 2

A) $\left(2^3\right)^{x-1} = 2^{3x-3} = 2\cdot\left(2^2\right)^{x+1} = 2^{2x+2+1} \rightarrow = 2^{3x-3} = 2^{2x+3} \rightarrow 3x-3 = 2x+3 \rightarrow x = \underline{\mathbf{6}}$

B) $3x^{5/3}+4x^{2/3}=15x^{-1/3} \rightarrow 3x^{5/3}+4x^{2/3}-15x^{-1/3} = x^{-1/3}\left(3x^2+4x-15\right)=0$

$\rightarrow x^{-1/3}(3x-5)(x+3)=0$ Since $x^{-1/3}$ never equals 0, the only solutions are $\underline{\mathbf{\frac{5}{3},-3}}$

C) $\sqrt{48x^2}-\sqrt{\frac{16}{3}}-12^{\frac{1}{2}}=0 \rightarrow 4\sqrt{3}\,|x|-\frac{4\sqrt{3}}{3}-2\sqrt{3}=0$

Dividing by $2\sqrt{3}$, $2|x|-\frac{2}{3}-1=0 \rightarrow |x|=\frac{5}{6} \rightarrow x = \underline{\mathbf{\pm\frac{5}{6}}}$