

**MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 2 - NOVEMBER 2007 SOLUTION KEY**

Round 5

$$A) = 1(-1)(1)^2 \left(\frac{\sqrt{2}}{2} \right)^3 = \underline{-\frac{\sqrt{2}}{4}}$$

$$B) \sin^2(120) = \tan(225) \cdot \cot(45) - \sin^2(x) \rightarrow \frac{3}{4} = 1 - \sin^2 x \rightarrow \sin x = \pm \frac{1}{2} \rightarrow \underline{30^\circ, 150^\circ, 210^\circ, 330^\circ}$$

$$C) \frac{\tan x + \sqrt{3}}{1 + \sqrt{3} \cot x} = 1 \rightarrow \tan x - 1 + \sqrt{3}(1 - \cot x) = 0 \rightarrow \tan^2 x - \tan x - \sqrt{3}(\tan x - 1) = 0$$
$$\rightarrow (\tan x - 1)(\tan x + \sqrt{3}) = 0 \rightarrow x = \underline{45^\circ, 225^\circ} \text{ [120}^\circ, 300^\circ \text{ are extraneous]}$$