Integration Bee Qualifying Test - 2014

You have 1 hour to complete all ten questions. Only answers written on the answer blank will be graded. Each problem is worth 2 points. The top 16 scores will advance to the next level. If there is a tie for the 16th position then the last question will be graded to break the tie. Good Luck!

1. \( I = \int \frac{x + 1}{\sqrt{x}} \, dx \) 

2. \( I = \int x \sin(x^2) \, dx \)

3. \( I = \int e^x \cot(e^x) \, dx \)

4. \( I = \int x \sin^{-1} x \, dx \)

5. \( I = \int (\sin 5x \cos 3x + \cos 5x \sin 3x) \, dx \)

6. \( I = \pi \int_{\pi/4}^{\pi/6} (\cos^2 x - \sin^2 x) \, dx \)

7. \( I = \int \frac{x}{x^2 + 1} \, dx \)

8. \( I = \int \frac{\sin x}{\cos^2 x + 5 \cos x + 6} \, dx \)

9. \( I = \int \sin^3 x \, dx \)

10. \( I = \int x^2 \sin 4x \, dx \)

Tie Breaking Question
This question will only be graded in event of a tie. Evaluate. Exact answers only.

11. \( I = \int_{\pi/6}^{\pi/3} \frac{\cos^3 x}{\sqrt{\sin x}} \, dx \)
1. \( I = \frac{2}{3}x^{3/2} + 2x^{1/2} + C \)

2. \( I = -\frac{1}{2} \cos(x^2) + C \)

3. \( I = \ln | \sin(e^x) | + C \)

4. \( I = x \sin^{-1} x + \sqrt{1 - x^2} + C \)

5. \( I = -\frac{\cos 8x}{8} + C \)

6. \( I = \frac{\pi}{2} \)

7. \( I = \frac{1}{2} \ln(x^2 + 1) + C \)

8. \( I = -(\ln | \cos x + 2| - \ln | \cos x + 3|) + C \)

9. \( I = \frac{\cos^3 x}{3} - \cos x + C \)

10. \( I = -\frac{1}{4}x^2 \cos 4x + \frac{1}{8}x \sin 4x + \frac{1}{32} \cos 4x + C \)

**Tie Breaking Question**

11. \( I = 2 \left( \frac{\sqrt{3}}{2} \right)^{1/2} - \frac{2}{5} \left( \frac{\sqrt{3}}{2} \right)^{5/2} - \sqrt{2} + \frac{\sqrt{32}}{80} \)