2010 Integration Bee

Qualifying Test

January 25, 2010

Name: _____

Email: _____

This is the qualifying test for the 2010 Integration Bee, which will be held on Wednesday, January 27th at 7PM in room 54-100. Finalists will be notified by email by midnight tonight (12:00am, Monday, January 25).

You have 20 minutes to solve these 25 integrals. Each integral is worth 1 point. In order to receive full credit you must express your answer in terms of x for indefinite integrals or simplified expressions in terms of constants for definite integrals, and **your answer must be circled**. There is no partial credit. The "$\log$" symbol denotes the natural logarithm. In your answers, it is not necessary to include the arbitrary constant C nor the absolute value sign around the argument of a logarithm.

Note: The problems are not arranged in order of difficulty. Budget your time carefully!

Good Luck!

1. $\int_0^{\pi/2} \sin(x)\sin(2x)\sin(3x)dx$

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2. $\int_0^{\pi/2} \sin(2x)^3\cos(x)dx$

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3. $\int (x+1)^2(x-1)^{1/3}dx$

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4. $\int x \log\left(1+\frac{1}{x}\right) dx$

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5. $\int_0^1 \sin^2(\log x)\, dx$

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6. $\int \frac{1}{1+3e^x} dx$

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7. $\displaystyle\int_{\pi/4}^{\pi/3} \frac{dx}{\sin(x)^3 \cos(x)^5}$

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8. $\displaystyle\int_1^{\infty} \frac{dx}{x\sqrt{x^4-1}}$

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9. $\displaystyle\int \frac{dx}{x(x^5+1)}\,dx$

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10. $\int_0^{\pi/4} \sqrt{\tan(x)}dx$

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11. $\int_0^1 \frac{\log(1+x)}{1+x^2}dx$

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12. $\int_{64}^{729} \frac{x^{1/2}}{x^{1/2}-x^{1/3}}\,dx$

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13. $\int x^x(1+\log(x))\,dx$

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14. $\int_0^1 x^{13/2}\sqrt{1+x^{5/2}}\,dx$

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15. $\int_1^\infty \dfrac{dx}{(x^2+1)^2}$

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16. $\int_0^1 \frac{dx}{x^4 - 13x^2 + 36} dx$

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17. $\int \frac{\log(\log(x))}{x} dx$

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18. $\int \frac{1 + \cot(x)}{1 - \cot(x)} dx$

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19. $\int \frac{\cos(x) + x\sin(x)}{x(x + \cos(x))} dx$

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20. $\int_0^{\pi/2} \frac{dx}{\sin(x) + \sec(x)} dx$

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21. $\int_0^{\infty} \frac{dx}{\sqrt{1 + e^x + e^{2x}}}$

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22. $\int_0^1 x^3 e^{x^2}\, dx$

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23. $\int_0^1 \sqrt{1+x\sqrt{1+x\sqrt{1+x\sqrt{\ldots}}}}\, dx$

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24. $\int \frac{1}{\log(x)} - \frac{1}{\log(x)^2} dx$

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25. $\int_1^2 (x-1)^{1/2}(2-x)^{1/2}\,dx$