2011 Integration Bee

Qualifying Test

January 14, 2011

Name: ____________________________________

Email: ____________________________________

This is the qualifying test for the 2011 Integration Bee, which will be held on Tuesday, January 18th at 5PM in room 10-250. Finalists will be notified by email by midnight tonight (12:00am, Friday, January 14th).

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. $\displaystyle\int \frac{x^6 - 1}{x^4 + x^3 - x - 1}\, dx$

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2. $\displaystyle\int 2\ln(x)+(\ln(x))^2\, dx$

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3. $\displaystyle\int 2\frac{x}{\sqrt{1-x^4}}\, dx$

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4. $$\int \frac{x^2+1}{x+1}\,dx$$

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5. $$\int \frac{\sin(x)^3+\sin(x)^2-2\sin(x)-2}{\sin(x)^2+2\sin(x)+1}\,dx$$

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6. $$\int \sinh(x)^{-2}\,dx$$

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7. $\displaystyle\int \sec(x)^4 \tan(x)^2 \, dx$

8. $\displaystyle\int \sqrt{\csc(x) - \sin(x)} \, dx$

9. $\displaystyle\int \cos(x)^6 \, dx$

10. $\displaystyle\int \frac{1}{1 + 2x^2 + x^4}\, dx$

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11. $\displaystyle\int \cos(\log(x))\, dx$

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12. $\displaystyle\int \frac{1}{\cos(x)}\, dx$

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13. $\displaystyle\int \frac{dx}{9\cos(x)^2 + 4\sin(x)^2}$

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14. $\displaystyle\int \frac{dx}{x^2(x^4+1)^{3/4}}$

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15. $\displaystyle\int_0^{\pi} \cos(x)\cos(3x)\cos(5x)\,dx$

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16. $\int \frac{1}{\log(x)} + \log(\log(x)) \, dx$

17. $\int \frac{1}{2+e^x} \, dx$

18. $\int \sqrt{\frac{x}{1-x^3}} \, dx$

19. $\displaystyle\int \frac{4x}{1-x^4}\,dx$

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

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21. $\displaystyle\int_0^6 \sqrt{6x-x^2}\,dx$

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22. $\displaystyle\int \sin(101x)\sin(x)^{99}\,dx$

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23. $\displaystyle\int xe^{e^{x^2}+x^2}\,dx$

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24. $\displaystyle\int_0^1 \frac{x^3-3x^2+3x-1}{x^4+4x^3+6x^2+4x+1}\,dx$

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25. $\displaystyle\int \sqrt{\frac{1-x}{1+x}}\,dx$