2012 Integration Bee

Qualifying Test

January 13, 2012

Name: _____

Email: _____

This is the qualifying test for the 2012 Integration Bee, held on Friday, January 13th at 4PM–6PM in room 4-149. Finalists will be notified by email by midnight tonight (12:00am, Saturday, 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. $\displaystyle\int \frac{dx}{\sqrt{x}-1}$

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2. $\displaystyle\int x^{1/4}\log(x)\,dx$

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

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4. $\displaystyle\int \frac{dx}{\sqrt{x}(\sqrt[4]{x}+1)^{10}}$

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5. $\displaystyle\int_0^1 \sin(\cos^{-1}(x))\,dx$

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

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7. $\displaystyle\int_{1/4}^{1/2} \left\lfloor \log \left\lfloor \frac{1}{x} \right\rfloor \right\rfloor \, dx$

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8. $\displaystyle\int_0^{\frac{\pi}{2}} \frac{dx}{1+\sin(x)}$

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9. $\displaystyle\int_1^{2011} \frac{\sqrt{x}}{\sqrt{2012-x}+\sqrt{x}}\, dx$

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10. $\displaystyle\int \frac{x-1}{(x+1)\sqrt{x^3+x^2+x}}\,dx$

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11. $\displaystyle\int_{-1}^{0} \frac{x^4+4x^3+6x^2+4x+1}{x^3-3x^2+3x-1}\,dx$

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12. $\displaystyle\int \left(\cos(x)\log(x)+\frac{\sin(x)}{x}\right)\,dx$

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13. $\displaystyle\int \frac{dx}{x^3 - x}$

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14. $\displaystyle\int_0^{1/2} \frac{x \sin^{-1}(x)}{\sqrt{1 - x^2}}\, dx$

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15. $\displaystyle\int_0^1 x(1 - x)^{99}\, dx$

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16. $\displaystyle\int_0^{\pi/2} \frac{\sin(4x)}{\sin(x)}\,dx$

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

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18. $\displaystyle\int \frac{dx}{\sqrt{2x^2-1}}$

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19. $\displaystyle\int \frac{dx}{\sqrt{e^x - 1}}$

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20. $\displaystyle\int \frac{x}{x^4 + 4}\, dx$

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21. $\displaystyle\int \frac{2\, dx}{(\cos(x) - \sin(x))^2}$

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22. $\displaystyle\int \frac{x\cosh(x)}{\sinh(x)^2}\,dx$

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23. $\displaystyle\int_0^2 x^5\sqrt{1+x^3}\,dx$

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24. $\displaystyle\int_0^1 \frac{x^7-1}{\log(x)}\,dx$

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