Integration bee Contest
Qatar 2024

Qualifying Test

First Name, Last Name	University affiliation

DO NOT OPEN UNTIL PERMITTED

1. Write your name and university affiliation on this script.
2. You have 60 minutes to complete 20 questions.
3. Each question is worth 1 point.
4. You MUST close the test and put your pencil down when the time is over.
5. Enter your final answer in the given box after each question. Only the answers inside the box will be graded.
6. You can use the given notepads for your scratchwork but enter your final answers in the boxes of this script.
7. Books, notes, calculators, electronic devices are not allowed.
8. Please abide by the following rules while solving the question :
   - Only the final answer counts in the determination of correctness.
   - Final answers may not be expressed in terms of other integrals.
   - Definite integrals must be evaluated.
   - Absolute values, if required, must be present.
9. The top 16 scores will move on to the final round.
10. Some questions are marked with an asterix *.These questions will be used to break a tie if needed.

GOOD LUCK!

Mark	
Out of	20

1. Evaluate
$$\int_1^2 (6x+5)(2x+1)\ dx.$$

Solution:

2. Evaluate
$$\int_0^1 \frac{\arctan x}{1+x^2}\ dx.$$

Solution:

3. If f is continuous, and $\int_0^9 f(x)\ dx = 4$, find $\int_0^3 xf(x^2)\ dx$.

Solution:

4. If $f(7) = 15$, f' is continuous, and $\int_2^7 f'(x)\ dx = 15$, what is the value of $f(2)$? .

Solution:

5.
$$\int_1^e \sqrt{1+\left(2x-\frac{1}{8x}\right)^2}\,dx$$

Solution:

6. Evaluate
$$\int_0^1 \frac{1}{1+e^x}\,dx$$

Solution:

7. Evaluate

$$\int (x - \cos x)^2 \, dx$$

Solution:

8. Evaluate

$$\int_{-2}^{2} |x - 1| \, dx.$$

Solution:

9. Evaluate

$$\int x^3 e^{x^2} \, dx.$$

Solution:

10. Evaluate

$$\int e^{-3x} \cos(4x) dx$$

Solution:

11. Evaluate

$$\int \ln(x^2 + 4) \, dx$$

Solution:

12.

$$\int_0^2 \frac{1}{\sqrt{12+4x-x^2}}\,dx$$

Solution:

13.

$$\int_1^e \frac{1}{x\left(\ln^2 x - 5\ln x + 6\right)}\,dx$$

Solution:

14. Evaluate

$$\int_2^{10} \sqrt{16-(x-6)^2}\,dx$$

Solution:

15. Evaluate

$$\int \sin^2(2x)\cos(4x)dx$$

Solution:

16. * Evaluate

$$\int_0^{\pi} \sqrt{1-\cos(4\theta)}\,d\theta$$

Solution:

17. * Evaluate

$$\int \frac{1}{x - 3\sqrt{x} + 2} dx$$

Solution:

18. *Evaluate

$$\int (2x^2 + 1)e^{x^2}\, dx$$

Solution:

19. *Evaluate

$$\int \frac{1}{1 - \sin x} dx$$

Solution:

20. *Evaluate

$$\int_0^{\frac{1}{\sqrt{3}}} 3x\sqrt{4 - 9x^4}\, dx$$

Solution: