Integration bee sample problems answers

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Introduction

This is a sheet of final answers to see if you got the right answer to check whether you managed the problem or need to keep trying. I hope you had fun doing the sample problems!

Solutions

1. $\ln 6$
2. $\frac{\pi}{2}$
3. $\frac{\pi}{4}$
4. 0
5. $\frac{\pi \ln 2}{8}$
6. $-\frac{\pi^2}{6}$
7. For integers n, we obtain $\Gamma(n) = (n-1)!$ - the Gamma function extends the factorial function to non integer arguments.
8. $\Gamma(s)\zeta(s)$
9. $\frac{1}{2} - \frac{1}{3}\zeta(3)$
10. π
11. $\frac{1}{2}(x + \ln(\sin x + \cos x)) + c$
12. $\sqrt{\tan x}$
13. $-\ln(1 + e^{-x})$
14. $\frac{1}{\sqrt{2}} \arctan(\sqrt{2} \tan(\ln x)) + c$
15. $\frac{1}{3}\ln(x+1) - \frac{1}{6}\left(\ln(x^2 - x + 1) + 2\sqrt{3}\arctan\left(\frac{2x-1}{\sqrt{3}}\right)\right) + c$
16. $\frac{2}{\sqrt{3}} \arctan\left(\frac{2\tan\left(\frac{x}{2}\right)+1}{\sqrt{3}}\right) + c$
17. $ex + c$
18. $\sec x + \tan x + c$
19. $\frac{1}{2}(\sin(\cos^{-1}(x^2)) - \cos^{-1}(x^2)) + c$
20. $e^x - \arctan e^x + \frac{1}{2}(\sec^2(\arctan(e^x))) + \ln|\cos(\arctan(e^x))| + c$