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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number** | **Continuous? Smooth? Where?** | **Other Observations** | **Preferred quadrature method** | **Integration Value** | **Interval** | **Cond #** | **Notes** |
| 1 | Yes, yes everywhere | Should be very easy | Clenshaw Curtis or Classical Gaussian/Gauss-Kronrod | 1.718281828459045 | [0, 1] | 1.581976706869326424385 | Gauss, p=30 |
| 2 | No, not at x=.3 | Constant on two separate intervals, derivative 0 | Adaptive Quadrature/Simpson’s Rule | 0.7000000000000000 | [0, 1] | 1.43 |  |
| 3 | No, not at x=0 | N/A | Adaptive Quadrature/Simpson’s Rule | 0.3785300171241612 | [0, 1] | 2.22 |  |
| 4 | No, not at x= -1, this should be continuous on the interval given though | CONDITION NUMBER UNDERFLOWS IN DENOMINATOR -> ILL CONDITIONED PROBLEM | Clenshaw Curtis or Classical Gaussian/Gauss-Kronrod | -1.696462819934577\*10^-15 | [0, 10^(-12)] |  |  |
| 5 | Yes, yes, everywhere | Spikes at x=.4  Possible cancellation errors?  Looking at graph should show why this one is continuous but not easy with gauss due to spike | Adaptive Quadrature/Simpson’s Rule? | 0.1727205034243749 | [0, 1] | 1.3 \* 10^(-6) |  |
| 6 | Yes, yes, everywhere | Should be easy | Clenshaw Curtis or Classical Gaussian/Gauss-Kronrod | 1.564396444069050 | [-1, 1] | .32 | CC, p=270 |
| 7 | Yes, but with noise | Noise, do a least squares | Least Squares | 1.692603132845149 (give or take .05 due to choice of epsilon) | [-1, 1] | .32 |  |
| 8 | Yes, yes, everywhere | Should be easy | Clenshaw Curtis or Classical Gaussian/Gauss-Kronrod | 1.000000000000000 | [0, 10] | 6.67\*10^(-107) |  |
| 9 | Yes, yes, everywhere | Possible cancellation errors in numerator  Possible overflow errors in numerator and denominator. Should probably rewrite/simplify  Simplifies to: (E^x)^(-1/10) - (E^x)^(9/10)/E^(11 x) | Clenshaw Curtis or Classical Gaussian/Gauss-Kronrod | 9.900536099712276 | [0, 100] | .00046 | CC, p=600, had to rewrite into (exp(x)).^(-1/10) - (exp(x)).^(9/10)./(exp(11\*x)) first |
| 10 | Yes, yes, everywhere | Should be very easy | Clenshaw Curtis or Classical Gaussian/Gauss-Kronrod | 1.833333333333333 | [0, 1] | 1.636363636363636363636363636 | Gauss, p=30 |
| 11 | No, not where e^x = .5, 1.5, 2.5, 3.5… 27.5 | Multiple discontinuities, Will be pretty tough  Looking at graph helps a lot | Adaptive Quadrature/Simpson’s Rule | 17.66446061011451 | [0, 3] | 3.4?? |  |
| 12 | Yes, yes, everywhere | Should be easy | Clenshaw Curtis or Classical Gaussian/Gauss-Kronrod | 0.4000000000000000 | [0, 1] | 2.500000000000000 | Works with fclencurt for high n values, CC, p=2000 |
| 13 | No, not at x=0 | N/A | Adaptive Quadrature/Simpson’s Rule | 2.000000000000000 | [0, 1] | .5 |  |
| 14 | No, not continuous when x=3. Not smooth at 1 or 3. | N/A | Adaptive Quadrature/Simpson’s Rule | 7.500000000000000 | [0, 5] | 1.333 |  |
| 15 | Yes, yes, everywhere | Should be easy  Should be similar to integral 6 | Clenshaw Curtis or Classical Gaussian/Gauss-Kronrod | 0.8669729873399110 | [0, 1] | .57 | CC, p=270 |

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| Number | Continuous? Smooth? Where? | Other Observations | Preferred quadrature method | **Integration Value** | **Interval** | **Cond numb** | **Notes** |
| 16 | Not continuous at x=0 | Not continuous  Oscillates heavily.  This is bad. Can't use either may need to combine and do a piecewise gauss | Clenshaw Curtis | 0.498986808693045 | [0, 1] | 0 | CC, p=2000 |
| 17 | No, not at x= -1 | N/A | Adaptive Quadrature/Simpson’s Rule | -0.4342944819032518 | [0, 1] | 0 |  |
| 18 | Yes, yes, everywhere on its domain | N/A | Clenshaw Curtis or Classical Gaussian/Gauss-Kronrod |  | [-1, 1] |  |  |
| 19 | Yes, yes, everywhere on its domain | N/A | Clenshaw Curtis or Classical Gaussian/Gauss-Kronrod | -0.0002000200020002000 | [-1, 1] | 4999.5 | CC, p=5000 |
| 20 | Yes, yes, everywhere (it’s a polynomial) | Computing the det as a polynomial is going to be hard | Clenshaw Curtis or Classical Gaussian/Gauss-Kronrod |  | [-1, 1] |  |  |
| 21 | Discontinuous on x=0 | N/A | Adaptive Quadrature/Simpson’s Rule | 0.3817732906760363 | [-1, 1] | 1.41 |  |
| 22 | Yes, yes, everywhere | Numerator is very small compared to denominator  May have to integrate first and then divide by constant | Clenshaw Curtis or Classical Gaussian/Gauss-Kronrod | 1.273239544735163\*10^-9 | [-1, 1] | 0 | CC, p=270 |
| 23 | Yes, yes | Approaches 0 as x approaches infinity (quickly) (for x greater than 36.5 the function underflows below machine precision  Will need something piecewise most likely | Adaptive Quadrature/Simpson’s Rule?? | 1.000000000000000 | [0, infinity] |  |  |
| 24 | Discontinuous at x=0 | N/A | Adaptive Quadrature/Simpson’s Rule | 0.2375252341425132 | [0,.5] | 0 |  |
| 25 | Discontinuous at endpoints??? | N/A | Adaptive Quadrature/Simpson’s Rule |  | [0,1] |  |  |
| 26 | Yes, yes, everywhere | N/A | Clenshaw Curtis or Classical Gaussian/Gauss-Kronrod | -0.5818757877653272 | [0, pi] | 0 |  |
| 27 | Yes, yes, everywhere | N/A | Clenshaw Curtis or Classical Gaussian/Gauss-Kronrod | 2.925303491814363 | [-1,1] | .93 | CC, p=270 |
| 28 | Discontinuous at x=0 | INTEGRAL APPARENTLY DIVERGES | Adaptive Quadrature/Simpson’s Rule | -124.8993729727460 (doesn’t converge) | [0,1] |  |  |
| 29 | Yes, yes, everywhere | Possible cancellation errors around x=0?? | Clenshaw Curtis or Classical Gaussian/Gauss-Kronrod | 1.047197551196598 | [-.5,.5] | .55 | CC, p=4600 |
| 30 | Discontinuous at x=0 | Also equals log(x) | Adaptive Quadrature/Simpson’s Rule | -1.000000000000000 | [0,1] | 0 |  |

16. Sin[100 Pi x]/(Pi x)

17. Log[x]

18. Cos[10000 ArcCos[x]]

19. Cos[100 ArcCos[x]]

20. ???

21. Piecewise[{{Sin[x], -1 <= x <= 0}, {Cos[x], 0 <= x <= 1}}]

22. Cos[Pi (x/2)]/10^9

23. E^(-x)

24. Log[2 x]/Log[x]

25. ???

26. Sin[5 Sin[x]]

27. E^x^2

28. Sin[x]/Log[x]

29. 1/Sqrt[1 - x^2]

30. Log[2 x] - Log[2]

SetPrecision[N[FullSimplify[Integrate[f9[x], {x, 0, 100}]]], 16]