Exam One Review Problems

1. $\int \frac{(\ln x)^5}{5x}dx$

2. $\int \frac{2\sec^2 x}{1+\tan^2 x}dx$

3. $\int \frac{3x+5}{5x^2-4x-1}dx$

4. $\int \frac{1}{x^2\sqrt{16-x^2}}dx$

5. $\int \frac{x^2}{\sqrt{5+x}}dx$

6. $\int 10xe^{10x}dx$

7. $\int x^6 \ln x dx$

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

9. $\int \frac{-2x^2+4}{x(x+1)(x+2)}dx$

10. $\int e^x \sin(4x)dx$

11. $\int \frac{1}{x^2\sqrt{25x^2-49}}dx$

12. $\int \frac{2x}{x^2-6x+9}dx$

13. $\int \frac{x+3}{x^2+2x+2}dx$

14. $\int \sec^7 x \tan^3 x dx$

15. $\int \sec^4 x \tan^2 x dx$

16. $\int \sin^5 x \cos^2 x dx$

17. $\int \sin^4 x dx$

18. $\int \frac{x^3}{\sqrt{x^2+1}}dx$

19. $\int \arctan(x)dx$

20. $\int \frac{10}{(1+9x^2)^{3/2}}dx$

21. $\int x^8\sqrt{4-x^6}dx$(Tables)

22. $\int \frac{x^5}{\sqrt{49-4x^4}}dx$(Tables)

Find the **exact** value of the definite integral:

23. $\int_{-2}^{0} xe^{-x^2}dx$

24. $\int_{0}^{2} \frac{e^x}{1+e^{2x}}dx$

Write out the form of the partial fraction decomposition of the following functions. Then stop. **Do not find the numerical coefficients.**

25. $\frac{4x^2}{(x+1)(x-2)^3}$

26. $\frac{4x^2}{x^8+125x^5}$

27. $\frac{4x^2}{x^4(x^2+x+1)^2}$

Write out the form of the partial fraction decomposition of the following functions. D**etermine the**

numerical values of the coefficients. Then stop.

28. $\frac{x-1}{x(x+2)^2}$ 29. $\frac{4x-2}{16x^4-1}$

30. Do the following for the given integral: $\int_1^2 15\cos(x^2)dx$

(a) Estimate the integral, using the Trapezoidal Rule with *n* = 4. (Round your answer to six decimal places.)

(b) Estimate the integral, using the Midpoint Rule with *n* = 4. (Round your answer to six decimal places).

31. Do the following for the given integral: $\int_0^\pi x^2\sin(x)dx, n = 6.$

(a) Estimate the integral, using the Midpoint Rule (Round your answer to six decimal places.)

(b) Use the Simpson's Rule to approximate the given integral with the specified value of *n*. (Round your answer to six decimal places.)

Solutions:

1. $\frac{(\ln x)^6}{30} + C$ 2. $2x + C$

3. $-\frac{11}{15}\ln|5x+1| + \frac{4}{3}\ln|x-1| + C$ 4. $-\frac{\sqrt{16-x^2}}{16x} + C$

5. $\frac{2}{15}\sqrt{x+5}(200 - 20x + 3x^2) + C$ 6. $\frac{1}{10}(10x-1)e^{10x} + C$

7. $\frac{x^7\ln x}{7} - \frac{x^7}{49} + C$ 8. $x - \arctan(x) + C$

9. $2\ln|x| - 2\ln|x+1| - 2\ln|x+2| + C$ 10. $-\frac{4}{17}e^x\cos(4x) + \frac{1}{17}e^x\sin(4x) + C$

11. $\frac{\sqrt{25x^2-49}}{49x} + C$ 12. $2\ln|x-3| - \frac{6}{x-3} + C$

13. $\frac{1}{2}\ln(x^2+2x+2) + 2\arctan(x+1) + C$ 14. $\frac{\sec^9 x}{9} - \frac{\sec^7 x}{7} + C$

15. $\frac{\tan^5 x}{5} + \frac{\tan^3 x}{3} + C$ 16. $-\frac{\cos^7 x}{7} + \frac{2\cos^5 x}{5} - \frac{\cos^3 x}{3} + C$

17. $\frac{1}{4}(\frac{3}{2}x - \sin(2x) + \frac{1}{8}\sin(4x)) + C$ 18. $\frac{1}{3}\sqrt{x^2+1}(x^2-2) + C$

19. $x\arctan x - \frac{1}{2}\ln(x^2+1) + C$ 20. $\frac{10x}{\sqrt{1+9x^2}} + C$

21. $\frac{1}{12}x^3(x^6-2)\sqrt{4-x^6} + \frac{2}{3}\arcsin\frac{x^3}{2} + C$ 22. $-\frac{x^2}{16}\sqrt{49-4x^4} + \frac{49}{32}\arcsin\frac{2x^2}{7} + C$

23. $\frac{e^{-4}-1}{2}$ 24. $\arctan(e^2) - \frac{\pi}{4}$

25. $\frac{A}{x+1} + \frac{B}{x-2} + \frac{C}{(x-2)^2} + \frac{D}{(x-2)^3}$ 26. $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x^3} + \frac{D}{x^4} + \frac{E}{x^5} + \frac{F}{x+5} + \frac{Gx+H}{x^2-5x+25}$

27. $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x^3} + \frac{D}{x^4} + \frac{Ex+F}{x^2+x+1} + \frac{Gx+H}{(x^2+x+1)^2}$

28. $-\frac{1}{4x} + \frac{1}{4(x+2)} + \frac{3}{2(x+2)^2}$

29. The rational function can be reduced to $\frac{2}{(2x+1)(4x^2+1)}$ and the PFD is $\frac{1}{2x+1} + \frac{1-2x}{4x^2+1}$

30. (a) – 6.275332 (b) – 6.832227

31. (a) 5.982132 (b) 5.868274

Additional Practice Problems

1. Integrate: $\int \frac{3\cos x}{1+\sin^2 x}\,dx$
2. Integrate: $\int 6x^5 \sin x^3\,dx$
3. Integrate: $\int \frac{x-7}{(x+3)(x-2)}\,dx$
4. Integrate: $\int sin^3(\theta)cos^{-2}(\theta)\;d\theta$
5. Find the exact value of $\int_0^1 5x\sqrt{1+3x^2}\,dx$
6. Find the exact value of $\int_0^1 \frac{\ln x}{x^3}\,dx$
7. **Use the integral $\int \frac{dx}{x^2\sqrt{49+x^2}}$ to answer questions A and B.**

i) Choose the appropriate trig-substitution from the list provide below.

A. $x = 7\sin\theta$ B. $x = 7\tan\theta$ C. $x = 7\sec\theta$ D. $x = 7\cos\theta$
E. None of the others

ii) Using the trig-substitution from part A, the resulting trigonometric integral in its simplified from is:

A. $\frac{1}{7}\int tan^2(\theta)d\theta$ B$\frac{1}{49}\int \frac{sin^2(\theta)}{\cos(\theta)}d\theta$ C. $\frac{1}{7}\int \frac{sin^2(\theta)}{\cos(\theta)}d\theta$
D. $\frac{1}{49}\int \frac{cos(\theta)}{\sin^2(\theta)}d\theta$ E. None of the others

8. Write the partial fraction decomposition of the rational function $\frac{2x-1}{(x+5)^2(x^2+4)}$

A. $\frac{A}{(x+5)^2}+\frac{Bx+C}{x^2+4}$ B. $\frac{A}{(x+5)}+\frac{B}{(x+5)^2}+\frac{Cx+D}{(x^2+4)}$ C. $\frac{A}{(x+5)}+\frac{B}{(x+5)^2}+\frac{D}{(x^2+4)}$
D. $\frac{Ax+B}{(x+5)^2}+\frac{Dx+C}{(x^2+4)}$ E. None of the others

Answers to additional Problems:

1. $3\tan^{-1}(\sin x)+C$
2. $-2x^3\cos x^3+2\sin x^3+C$
3. $2ln|x+3|-ln|x-2|$ + c
4. $\cos(x)+\sec(x)+c$
5. 35/9
6. $-\frac{\ln 3}{18}+\frac{2}{9}$
7. i. B ii D
8. B