Math 2320 - Test 2 Review

1 Techniques of Integration

1. $\int \frac{x}{x^2-1}dx$
2. $\int \frac{e^x}{1+e^x}dx$
3. $\int \frac{e^x}{1+e^{2x}}dx$
4. $\int \frac{\ln(x)}{x}dx$
5. $\int x\ln(x)dx$
6. $\int x^2e^xdx$
7. $\int \arctan(x)dx$
8. $\int \ln(x)dx$
9. $\int x\sin(2x)dx$
10. $\int \sin^2(3x)\cos(3x)dx$
11. $\int \sin^2(3x)\cos^3(3x)dx$
12. $\int \sin^2(3x)dx$
13. $\int \sin^2(4x)\cos^2(4x)dx$
14. $\int \tan^3(x)\sec^2(x)dx$

15. $\int \frac{1}{\sqrt{4-9x^2}}dx$

16. $\int \frac{1}{4+9x^2}dx$

17. $\int \frac{1}{(1-x^2)^{3/2}}dx$

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

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

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

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

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

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

24. $\int \frac{1}{x^3(x^2+1)^2(x-1)^3}dx$ Set up the partial fractions only. Do not solve for A,B,.... or integrate.

25. $\int_1^\infty \frac{1}{x}dx$

26. $\int_1^\infty \frac{1}{x^2}dx$

27. $\int_1^\infty \frac{1}{x^{1/2}}dx$

28. $\int_0^1 \frac{1}{x}dx$

29. $\int_0^1 \frac{1}{x^2}dx$

30. $\int_0^1 \frac{1}{x^{1/2}} dx$

31. $\int_1^\infty x e^{-x} dx$

32. $\int_0^1 \ln(x) dx$

2 Sequences and Series

33. Determine if the series converges or diverges, state the test used, the criteria satisfied and, as always, show your work. If the series converges, what is the sum?

34. $\sum_{k=1}^{\infty} 2^k$

35. $\sum_{k=1}^{\infty} 2^{-k}$

36. $\sum_{k=1}^{\infty} \frac{2^k}{3^k}$

37. $\sum_{k=1}^{\infty} \frac{1}{k} - \frac{1}{k+2}$

38. $\sum_{k=1}^{\infty} \sqrt{k+1} - \sqrt{k}$

39. $\sum_{k=1}^{\infty} \ln \frac{k+1}{k}$

40. Determine if the series converges or diverges, state the test used, the criteria satisfied and, as always, show your work.

41. $\sum_{n=1}^{\infty} \frac{\sqrt{k}+1}{\sqrt{4k+1}}$

42. $\displaystyle\sum_{k=1}^{\infty} \frac{k}{4k+1}$

43. $\displaystyle\sum_{k=1}^{\infty} \frac{1-\cos k}{k^2}$

44. $\displaystyle\sum_{k=1}^{\infty} e^{-k}$

45. $\displaystyle\sum_{k=1}^{\infty} ke^{-k^2}$

46. $\displaystyle\sum_{k=1}^{\infty} \frac{1}{k\ln^{3/2}(k)}$

47. $\displaystyle\sum_{k=1}^{\infty} \frac{1}{k^3}$

48. $\displaystyle\sum_{k=1}^{\infty} \frac{1}{\sqrt{k}}$

49. $\displaystyle\sum_{k=1}^{\infty} \frac{k^2+1}{k^4}$

50. $\displaystyle\sum_{k=1}^{\infty} \frac{k^2+1}{k^3}$

51. $\displaystyle\sum_{k=1}^{\infty} \frac{2^k}{3^k+1}$

52. $\displaystyle\sum_{k=1}^{\infty} \frac{k^2}{k^3+1}$

53. $\displaystyle\sum_{k=1}^{\infty} \frac{k^2}{3k^2+1}$

54. $\displaystyle\sum_{k=1}^{\infty} \frac{k^2}{3k^4+1}$

55. $\displaystyle\sum_{k=1}^{\infty} \frac{k}{\sqrt{3k^4+1}}$

56. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{1}{\sqrt{n}}$

57. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{1}{n}$

58. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{1}{\ln(n)}$

59. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{n}{\ln(n)}$

60. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{\ln(n)}{n}$

61. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \sin\frac{1}{n}$

62. $\displaystyle\sum_{n=1}^{\infty} \frac{n}{n!}$

63. $\displaystyle\sum_{n=1}^{\infty} \frac{2^n}{n!}$

64. $\displaystyle\sum_{n=1}^{\infty} \frac{n^2 2^n}{n!}$

65. $\displaystyle\sum_{k=1}^{\infty} \frac{1}{n^n}$

66. $\displaystyle\sum_{k=1}^{\infty} \frac{n!}{n^n}$

67. $\displaystyle\sum_{n=1}^{\infty} \left(\frac{\sqrt{n}+1}{\sqrt{4n+1}}\right)^n$

68. $\displaystyle\sum_{n=1}^{\infty}\left(1+\frac{1}{4n}\right)^n$

69. $\displaystyle\sum_{n=1}^{\infty}\left(1-\frac{1}{4n}\right)^n$

70. $\displaystyle\sum_{n=1}^{\infty}\frac{1}{(\ln(n))^n}$

3 Power and Taylor Series

71. What are the radii and intervals of convergence of the following power series.

    (a) $\displaystyle\sum_{n=1}^{\infty}\frac{1}{n}x^n$

    (b) $\displaystyle\sum_{n=1}^{\infty}\frac{1}{n^2}x^n$

    (c) $\displaystyle\sum_{n=1}^{\infty}\frac{1}{n^2}(x-5)^n$

    (d) $\displaystyle\sum_{n=0}^{\infty}\frac{1}{n!}x^n$

    (e) $\displaystyle\sum_{n=0}^{\infty}x^n$

    (f) $\displaystyle\sum_{n=0}^{\infty}\frac{(-1)^n}{2n+1}x^{2n+1}$

72. Find the Taylor series from the definition

    (a) $f(x)=\sin(2x)$ at $x=0$

    (b) $f(x)=e^x$ at $x=0$

    (c) $f(x)=\frac{1}{1-x}$ at $x=0$

    (d) $f(x)=\ln(x+1)$ at $x=0$

73. Find the Taylor series from a known Taylor series. Using only the taylor series for e^x, $\sin(x)$, $\cos(x)$, and $\frac{1}{1-x}$

(a) $f(x) = x\sin(x^2) - x^3$

(b) $f(x) = \frac{\sin(x)}{x}$

(c) $f(x) = \frac{e^{x^2} - 1 - x^2}{x^4}$