

Review Packet for Exam #2

Math 121-D. Benedetto

Integrals: Compute each of the following integrals, or else show that it diverges.

1. $\int_3^{\infty} \frac{1}{x^2 - 4x + 7} dx$

2. $\int_e^{\infty} \frac{1}{x(\ln x)^3} dx$

3. $\int_0^{\infty} \frac{1}{(x+2)(2x+5)} dx$

4. $\int_7^{\infty} \frac{1}{x^2 - 8x + 19} dx$

5. $\int_2^{\infty} \frac{1}{x^2 - 2x + 4} dx$

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

7. $\int_0^{\frac{\pi}{2}} \tan x dx$

8. $\int_3^4 \frac{1}{(x-4)^2} dx$

9. $\int_1^2 \frac{1}{x \ln x} dx$

10. $\int_0^1 \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$

11. $\int_1^{\infty} \frac{\ln x}{x} dx$

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

13. $\int_0^1 \frac{e^x}{\sqrt{e^x-1}} dx$

14. $\int_0^1 \ln x dx$

15. $\int_0^1 \frac{1}{(1-x^2)^{\frac{3}{2}}} dx$

16. $\int_{-\infty}^{\infty} \frac{1}{x^2 - 6x + 10} dx$

$$17. \int_{-5}^0 \frac{x}{x^2 + 4x - 5} dx$$

~~$$18. \int \frac{x^5 + 2}{x^2 - 1} dx$$~~

$$19. \int_0^6 \frac{1}{(x-2)^2} dx$$

$$20. \int_0^\infty \frac{1}{x^2 + 3x + 2} dx$$

$$21. \int_0^{\frac{\pi}{2}} \tan^2 x dx$$

$$22. \int_0^2 \frac{1}{(4-x^2)^{\frac{3}{2}}} dx$$

$$23. \int \frac{4x^2 + 7x + 6}{(x+2)(x^2+4)} dx$$

$$24. \int_1^\infty \frac{1}{x(x+1)} dx$$

$$25. \int_{-3}^{-2} \frac{1}{x^2 - 4} dx$$

$$26. \int_0^1 \arcsin x dx \text{ (leads to improper integral)}$$

~~$$27. \int \frac{x^3 + 7x + 1}{x^2 + 1} dx$$~~

~~$$28. \int \frac{x^4 + x^3 + 2x^2 + 6x + 2}{(x+1)(x^2+1)} dx$$~~

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

$$30. \int_{-1}^0 \frac{e^{\frac{1}{x}}}{x^2} dx$$

$$31. \int_{-\infty}^\infty \frac{x^2}{9+x^6} dx$$

$$32. \int_2^\infty \frac{x}{e^{3x}} dx$$

$$33. \int_0^e \frac{\ln x}{\sqrt{x}} dx$$

Sequences: For each of the following sequences, decide whether it converges or diverges. If it converges, compute its limit.

$$34. \left\{ \frac{1 + n - 7n^4}{3n^4 + 8n^3 + 9} \right\}_{n=1}^{\infty}$$

$$35. \left\{ \frac{n^3}{(n+1)^3} \right\}_{n=1}^{\infty}$$

$$36. \left\{ \left(\frac{n-5}{n} \right)^n \right\}_{n=1}^{\infty}$$

$$37. \left\{ \frac{(2n+3)!}{(2n+5)!} \right\}_{n=1}^{\infty}$$

$$38. \{ \arctan(n^2 + 1) \}_{n=1}^{\infty}$$

$$39. \left\{ \frac{\sqrt{n}}{(\ln n)^2} \right\}_{n=1}^{\infty}$$

$$40. \left\{ n^{\frac{1}{n}} \right\}_{n=1}^{\infty}$$

$$41. \left\{ n \sin \left(\frac{1}{n} \right) \right\}_{n=1}^{\infty}$$

$$42. \left\{ \left(\frac{n+1}{n} \right)^n \right\}_{n=1}^{\infty}$$

$$43. \left\{ \left(\frac{n}{n+1} \right)^n \right\}_{n=1}^{\infty}$$

Series: Find the **sum** for each of the following series (all of which converge):

$$44. \sum_{n=1}^{\infty} \frac{2^n + 3^n}{6^n}$$

$$45. \sum_{n=1}^{\infty} \frac{(-1)^{n+1} 2^{n-1}}{3^{n+1}}$$

$$46. \sum_{n=1}^{\infty} \frac{(-1)^n 3^{n+2}}{2^{4n-1}}$$

$$47. \sum_{n=1}^{\infty} \frac{(-1)^n 4^n}{3^{2n-1}}$$

More Series: Determine whether each of the following series **converge** or **diverge**. Name any convergence test(s) you use, and justify all of your work

$$48. \sum_{n=1}^{\infty} \frac{2n^3 - \ln n}{5n^3 + 9}$$

$$49. \sum_{n=1}^{\infty} \frac{\ln n}{n^2}$$

$$50. \sum_{n=1}^{\infty} \frac{\sqrt{n} + 3}{4n^2 - 2}$$

$$51. \sum_{n=1}^{\infty} \frac{n^{19} + 40n^6 + 4n^3 + 19}{4 + 17n^5 + n^{20}}$$

$$52. \sum_{n=2}^{\infty} \frac{e^n}{\ln n}$$

$$53. \sum_{n=1}^{\infty} \frac{5}{n^5} + \frac{1}{5^n}$$

$$54. \sum_{n=1}^{\infty} \frac{1 + 3n^3}{n^5}$$

$$55. \sum_{n=2}^{\infty} \frac{1}{n(\ln n)^7}$$

$$56. \sum_{n=1}^{\infty} \frac{\arctan n}{1 + n^2}$$

$$57. \sum_{n=1}^{\infty} \frac{n^2 + 1}{\arctan n}$$

$$58. \sum_{n=1}^{\infty} \frac{2n + 5}{5n^3 + 3n^2}$$

$$59. \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2 + 5n - 3}$$

$$60. \sum_{n=1}^{\infty} \frac{\pi}{\arctan(2n)}$$

$$61. \sum_{n=1}^{\infty} 3 + \frac{1}{3^n}$$

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

$$63. \sum_{n=1}^{\infty} \frac{6}{n^6} + \frac{1}{(n+1)^6}$$

$$64. \sum_{n=1}^{\infty} \cos^2 \left(\frac{\pi n^2 + n}{n^2 + 7} \right)$$

$$65. \sum_{n=1}^{\infty} (-1)^n \frac{\cos^2(\pi n^2 + 1)}{n^2 + 7}$$

Even More Series: Determine whether each of the following series **converges absolutely**, **converges conditionally**, or **diverges**. Name any convergence test(s) you use, and justify all of your work.

$$66. \sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{5n+2}$$

$$67. \sum_{n=1}^{\infty} (-1)^n \frac{n^3 + 6n}{n^8 + 1}$$

$$68. \sum_{n=1}^{\infty} \frac{5^{2n}}{(2n+1)! \ln n}$$

$$69. \sum_{n=1}^{\infty} \frac{n! n^6 n^n}{10^{4n} e^{2n}}$$

$$70. \sum_{n=1}^{\infty} (-1)^n \frac{1}{4n+3}$$

$$71. \sum_{n=1}^{\infty} \frac{(n!)^3 e^{2n}}{(3n)! n^n}$$

$$72. \sum_{n=1}^{\infty} (-1)^{n+1} \frac{\arctan n}{n^7 + n}$$

$$73. \sum_{n=1}^{\infty} \frac{(-1)^n (3n)! n^2}{8^n (n!)^2 n^n}$$

$$74. \sum_{n=1}^{\infty} (-1)^n \frac{n^3 + 7}{n^7 + 3}$$

$$75. \sum_{n=1}^{\infty} \frac{(-1)^n (\ln n) \pi^n (2n)!}{n^n 4^n n!}$$