

Math1220 Midterm 2
Review Problems
(Chapter 7 and 8)

Problems

Answers

1. $\int \frac{1}{\sqrt{x} + \sqrt[3]{x}} dx$

2. $\int \cos^3 x \sin^4 x dx$

3. $\int \frac{2x^4 - 2x^3 + 6x^2 - 5x + 1}{x^3 - x^2 + x - 1} dx$

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

5. $\int \frac{x^2}{(1 - 9x^2)^{\frac{3}{2}}} dx$

6. $\int \cos(\sqrt{x}) dx$

7. $\int \frac{3x - 5}{\sqrt{1 - x^2}} dx$

8. $\int \frac{3x^3 - 18x^2 + 29x - 4}{(x + 1)(x - 2)^3} dx$

9. $\int \frac{e^{2x}}{\sqrt[3]{1 + e^x}} dx$

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

11. $\int \frac{x^2 - x - 21}{2x^3 - x^2 + 8x - 4} dx$

12. $\int x^2 e^{3x} dx$

13. $\int \frac{2x - 1}{x^2 - 6x + 13} dx$

14. $\int \frac{e^{2x}}{4 + e^{4x}} dx$

15. $\int \arcsin x dx$

16. $\int x^5 \ln x dx$

17. $\int \sqrt{x} e^{\sqrt{x}} dx$

18. $\int \tan^3 x \sec^5 x dx$

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

1. $2(\sqrt[6]{x} + 1)^3 - 9(\sqrt[6]{x} + 1)^2 + 18(\sqrt[6]{x} + 1) - 6 \ln |\sqrt[6]{x} + 1| + C$

2. $\frac{1}{5} \sin^5 x - \frac{1}{7} \sin^7 x + C$

3. $x^2 + \ln|x - 1| + \frac{3}{2} \ln(x^2 + 1) + C$

4. $x \tan x + \ln|\cos x| + C$

5. $\frac{1}{27} \left(\frac{3x}{\sqrt{1 - 9x^2}} - \arcsin(3x) \right) + C$

6. $2\sqrt{x} \sin(\sqrt{x}) + 2 \cos(\sqrt{x}) + C$

7. $-3\sqrt{1 - x^2} - 5 \arcsin x + C$

8. $2 \ln|x + 1| + \ln|x - 2| + \frac{3}{x - 2} - \frac{1}{(x - 2)^2} + C$

9. $\frac{3}{5}(1 + e^x)^{\frac{5}{3}} - \frac{3}{2}(1 + e^x)^{\frac{2}{3}} + C$

10. $\frac{-1}{1 + \tan x} + C$

11. $\frac{-5}{2} \ln|2x - 1| + \frac{1}{2} \arctan\left(\frac{x}{2}\right) + \frac{3}{2} \ln(x^2 + 4) + C$

12. $\frac{1}{3} x^2 e^{3x} - \frac{2}{9} x e^{3x} + \frac{2}{27} e^{3x} + C$

13. $\ln((x - 3)^2 + 4) + \frac{5}{2} \arctan\left(\frac{x - 3}{2}\right) + C$

14. $\frac{1}{4} \arctan\left(\frac{e^{2x}}{2}\right) + C$

15. $x \arcsin x + \sqrt{1 - x^2} + C$

16. $\frac{1}{6} x^6 \ln x - \frac{1}{36} x^6 + C$

17. $2x e^{\sqrt{x}} - 4\sqrt{x} e^{\sqrt{x}} + 4 e^{\sqrt{x}} + C$

18. $\frac{1}{7} \sec^7 x - \frac{1}{5} \sec^5 x + C$

19. $\sqrt{4x^2 - 9} - 3 \arccos\left(\frac{3}{2x}\right) + C$

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Answers

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

20. $\frac{-1}{(x^2+1)^2} + C$

21. $\int \frac{\sqrt[3]{x+8}}{x} dx$ (This is a very challenging one.)

21. $3\sqrt[3]{x+8} + 2 \ln|\sqrt[3]{x+8}-2| - 22 \ln \left| \frac{\sqrt{3}}{(\sqrt[3]{x+8}+1)^2+3} \right| - 10\sqrt{3} \arctan \left(\frac{\sqrt[3]{x+8}+1}{\sqrt{3}} \right) + C$

22. $\int x \sqrt{2-3x} dx$

22. $\frac{-4}{27}(2-3x)^{\frac{3}{2}} + \frac{2}{45}(2-3x)^{\frac{5}{2}} + C$

23. $\int \sqrt{x(6-x)} dx$

23. $\frac{9}{2} \arcsin \left(\frac{x-3}{3} \right) + \frac{1}{2}(x-3)\sqrt{9-(x-3)^2} + C$

24. $\int \cos(4x) \cos(3x) dx$

24. $\frac{1}{14} \sin(7x) + \frac{1}{2} \sin x + C$

25. $\lim_{x \rightarrow \infty} (\sqrt{x^2+4} - \arctan x)$

25. ∞

26. $\int_4^{\infty} \frac{1}{x\sqrt{x}} dx$

26. 1

27. $\lim_{x \rightarrow \frac{\pi}{2}^-} (\cos x \ln(\cos x))$

27. 0

28. $\lim_{x \rightarrow 0} (1+3x)^{\frac{1}{2x}}$

28. $e^{\frac{3}{2}}$

29. $\lim_{x \rightarrow 0^+} (x^2 \ln x)$

29. 0

30. $\int_3^{\infty} \frac{1}{x-1} dx$

30. ∞

31. $\lim_{x \rightarrow \infty} \left(\frac{\ln(\ln x)}{\ln x} \right)$

31. 0

32. $\lim_{x \rightarrow 0} \left(\frac{\arcsin(2x)}{\arcsin(x)} \right)$

32. 2

33. $\int_{-\infty}^2 \frac{1}{5-2x} dx$

33. ∞

34. $\lim_{x \rightarrow \infty} (x^2-1)e^{-x^2}$

34. 0

35. $\lim_{x \rightarrow 0^+} (2x+1)^{\cot x}$

35. e^2

36. $\lim_{x \rightarrow 0^+} \left(\frac{1+x-e^x}{x^3} \right)$

36. $-\infty$

37. $\int_{-\infty}^{\infty} \frac{1}{1+x^2} dx$

37. π

Problems

Answers

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|-----|---|-----|------------------|
| 38. | $\lim_{x \rightarrow -3} \left(\frac{x}{x^2 + 2x - 3} - \frac{4}{x + 3} \right)$ | 38. | DNE |
| 39. | $\int_{-\infty}^{\infty} \frac{1}{e^x + e^{-x}} dx$ | 39. | $\frac{\pi}{2}$ |
| 40. | $\int_0^{\infty} x e^{-x} dx$ | 40. | 1 |
| 41. | $\lim_{x \rightarrow 5} \left(\frac{\sqrt{x-1} - 2}{x^2 - 25} \right)$ | 41. | $\frac{1}{40}$ |
| 42. | $\lim_{x \rightarrow 0} \left(\frac{e^x + e^{-x}}{x^2} \right)$ | 42. | ∞ |
| 43. | $\int_{-2}^0 \frac{1}{\sqrt{4-x^2}} dx$ | 43. | $\frac{\pi}{2}$ |
| 44. | $\int_{-1}^1 x^{-\frac{4}{3}} dx$ | 44. | diverges |
| 45. | $\int_{\frac{\pi}{2}}^{-1} \tan^2 x dx$ | 45. | diverges |
| 46. | $\int_0^9 \frac{x}{\sqrt[3]{x-1}} dx$ | 46. | $\frac{243}{10}$ |
| 47. | $\int_{-1}^2 \frac{1}{x^2} \cos\left(\frac{1}{x}\right) dx$ | 47. | diverges |