

Math 266 Second Exam Practice Problems

Evaluate the following integrals.

1. $\int \frac{\sqrt{x}}{1+x} dx = 2\sqrt{x} - 2 \tan^{-1} \sqrt{x} + C$

2. $\int \frac{4x-2}{x^3-x} dx = \ln \frac{x^2|x-1|}{|x+1|^3} + C$

3. $\int \frac{1}{x^2-x+1} dx = \frac{2\sqrt{3}}{3} \tan^{-1} \frac{2x-1}{\sqrt{3}} + C$

4. $\int x^2 \tan^{-1} x dx = \frac{1}{6} [2x^3 \tan^{-1} x - x^2 + \ln(x^2+1)] + C$

5. $\int \sqrt{x^2+x+1} dx = \frac{(2x+1)\sqrt{x^2+x+1}}{4} + \frac{3}{8} \ln \frac{2\sqrt{x^2+x+1}+2x+1}{\sqrt{3}} + C$

6. $\int (x-x^2)^{3/2} dx = \frac{1}{8} \sin \theta - \frac{1}{16} \sin^2 \theta + C$

7. $\int \frac{4x-2}{x^3-x} dx = \ln \frac{x^2|x-1|}{|x+1|^3} + C$ (same as #2)

8. $\int \frac{\sec x \tan x}{\sec x + \sec^2 x} dx = C - \ln|1 + \cos x|$

9. $\int \sin \sqrt{x} dx = -2\sqrt{x} \cos \sqrt{x} + 2 \sin \sqrt{x} + C$

10. $\int \frac{(1+x^{2/3})^{3/2}}{x^{1/3}} dx = \frac{(1+x^{2/3})^{3/2}}{3} + \frac{1}{2} \ln \frac{1-\sqrt{1+x^{2/3}}}{1+\sqrt{1+x^{2/3}}} + C$

11. $\int \tan^3 z dz = \frac{1}{2} \tan^2 z + \ln|\cos z| + C$

12. $\int \sin^2 \omega \cos^4 \omega d\omega = \frac{1}{192} (12\omega + 6 \sin 2\omega + 2 \sin^3 2\omega - 3 \sin 4\omega) + C$

13. $\int \frac{1}{x\sqrt{1+x^2}} dx = \ln \frac{\sqrt{1+x^2}-1}{|x|} + C$

14. $\int \frac{2x^2-5x-1}{x^3-2x^2-x+2} dx = \ln \frac{(x-1)^2|x+1|}{|x-2|} + C$

15. $\int \tan^3 4x \sec^4 4x dx = \frac{1}{24} \sec^6 4x - \frac{1}{16} \sec^4 4x + C$

16. $\int \cos^6 \left(\frac{x}{2} \right) dx = \frac{5}{16} x + \frac{3}{8} \sin x + \frac{3}{32} \sin 2x + \frac{1}{8} \sin x - \frac{1}{24} \sin^3 x + C$

17. $\int \frac{\sin \theta - \cos \theta}{\sin \theta + \cos \theta} d\theta = \frac{1}{2} \ln \left| \frac{\sec 2\theta}{\sec 2\theta + \tan 2\theta} \right| + C$

18. $\int \frac{x^4}{(x-1)^2} dx = \frac{1}{3} x^3 + x^2 + 3x + 4 \ln|x-1| - \frac{1}{x-1} + C$

19. $\int \frac{e^{\sqrt{\sin x}}}{(\sec x)\sqrt{\sin x}} dx = e^{\sqrt{\sin x}} + C$

20. $\int \sqrt{\tan \theta} d\theta = \sqrt{2} \ln \frac{\tan \theta - \sqrt{2 \tan \theta} + 1}{\tan \theta + \sqrt{2 \tan \theta} + 1} + \frac{\sqrt{2}}{2} \left[\tan^{-1}(\sqrt{2 \tan \theta} - 1) + \tan^{-1}(\sqrt{2 \tan \theta} + 1) \right] + C$