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Answers to the "Hand-out Notes"

Cal II (S) (Maths 201–NYB)

Integration by Parts

1. $-\frac{1}{2}x^2\cos 2x + \frac{1}{4}\cos 2x + \frac{1}{2}x\sin 2x + C$
2. $x\tan x - \ln|\sec x| + C$
3. $\frac{1}{2}x^2\,\mathrm{arcsec}\,x - \frac{1}{2}\sqrt{x^2-1} + C$
4. $\frac{3}{34}\,\mathrm{e}^{3x}\cos 5x + \frac{3}{34}\,\mathrm{e}^{3x}\sin 5x + C$
5. $\frac{1}{2}x^2\ln x - \frac{1}{4}x^2 + C$

Trigonometric Integrals

1. $\frac{1}{3}\cos^3 x - \cos x + C$
2. $\frac{3}{8}x - \frac{1}{4}\sin 2x + \frac{1}{32}\sin 4x + C$
3. $\frac{1}{16}x - \frac{1}{64}\sin 4x + \frac{1}{48}\sin^3 2x + C$
4. $\frac{1}{4}\tan^4 x - \sec^2 x + \ln|\sec x| + C$
5. $\frac{2}{3}\tan^{3/2} x + C$
6. $\frac{2}{5}\sec^{5/2} x - 2\sqrt{\sec x} + C$
7. $\frac{1}{6}\tan^6 x + \frac{1}{4}\tan^4 x + C$
8. $\frac{3}{2}\csc^{2/3} x - \frac{3}{8}\csc^{8/3} x + C$
9. $-\frac{1}{2}\cot^2 x + \ln|\csc x| + C$
10. $-\frac{3}{4}\cot^{4/3} x - \frac{3}{10}\cot^{10/3} x + C$
11. $\ln|\sec(\ln x)| + C$
12. $\frac{1}{18}\cos^3 6x - \frac{1}{6}\cos 6x + C$
13. $\frac{1}{5}\sec^{5/2} x^2 - \sqrt{\sec x^2} + C$

Trigonometric Substitution

1. $\sqrt{4-x^2} - 2\ln\left|\frac{2}{x} + \frac{\sqrt{4-x^2}}{x}\right| + C$
2. $\sqrt{x^2-4} + C$
3. $\frac{1}{2}\ln(x^2+2x+5) + \arctan\left(\frac{x+1}{2}\right) + C$
4. $\frac{1}{\sqrt{2}}\arcsin\left(\frac{x+1}{2}\right) + C$
5. $\frac{1}{2}x\sqrt{9-8x^2} + \frac{9}{4\sqrt{2}}\arcsin\left(\frac{4x}{3\sqrt{2}}\right) + C$
6. $\frac{1}{4}x(a^2-x^2)^{3/2} + \frac{3}{8}a^2x\sqrt{a^2-x^2} + \frac{3}{8}a^4\arcsin(\frac{x}{a}) + C$
7. $\ln(x + \sqrt{x^2-9}) + C$
8. $\frac{1}{2}\arcsin(2x-1) + C$
9. $\sqrt{x^2-9} - 3\,\mathrm{arcsec}(\frac{x}{3}) + C$
10. $\ln|\sqrt{x^2+6x+13} + x + 3| + C$
11. $\frac{1}{3}x^3 - x + 2\arctan x + C$
12. (Too long!)