Cal II (S) (Maths 201–NYB)

Integrate:

1. $\int x^2\sqrt{x+2}\,dx$
2. $\int \frac{x\,dx}{\sqrt{4-x^2}}$
3. $\int \cos^4 x\,dx$
4. $\int (2x+1)\sqrt{x^2+x+1}\,dx$
5. $\int \frac{x\,dx}{\sqrt{2-x}}$
6. $\int \frac{dx}{(5+4x)^{3/2}}$
7. $\int \frac{du}{u\ln u}$
8. $\int \frac{\sec^4 x\,dx}{\sqrt[3]{\tan x}}$
9. $\int (x+2)\sqrt{x-3}\,dx$
10. $\int \frac{dx}{x\sqrt{4x^2-1}}$
11. $\int \sin^2 x\cos^2 x\,dx$
12. $\int \frac{\sin x+\cos x+1}{\sin x}\,dx$
13. $\int \frac{e^{2x}\,dx}{1+e^{4x}}$
14. $\int \frac{2+x}{\sqrt{1-x^2}}\,dx$
15. $\int_{\sqrt{2}}^{2} \frac{\operatorname{arcsec} t\,dt}{t\sqrt{t^2-1}}$
16. $\int \frac{x^3+x^2+x+2}{x^2+1}\,dx$
17. $\int \sec^4 x\tan^3 x\,dx$
18. $\int_0^1 \frac{x+\arctan x}{1+x^2}\,dx$
19. $\int \frac{e^{2x}\,dx}{1+e^{2x}}$
20. $\int \frac{\sin^3(\sqrt{x}\,)\cos(\sqrt{x}\,)}{\sqrt{x}}\,dx$
21. $\int \frac{\cos^3 x\,dx}{\sin^4 x}$
22. $\int \frac{dx}{x(\ln x+9)}$
23. $\int \frac{dx}{x\sqrt{9x^2-1}}$
24. $\int \frac{1+\cos\theta+\sin\theta\cos\theta}{\cos^2\theta}\,d\theta$
25. $\int \frac{\cos^5 x\,dx}{\sin^4 x}$
26. $\int \frac{dx}{x(\ln^2 x+9)}$
27. $\int \frac{\cos^3 x\,dx}{\sin^6 x}$
28. $\int \frac{x^3-2x^2+x-7}{x+2}\,dx$
29. $\int e^{2x}\sin(e^{2x})\,dx$
30. $\int \frac{x\,dx}{\sqrt{9x^2-1}}$
31. $\int \frac{\sec^2 x\,dx}{1+\tan^2 x}$
32. $\int \sec^3 x\tan^4 x\,dx$
33. $\int \frac{\sqrt{\ln t}}{t}\,dt$
34. $\int \frac{dx}{x\sqrt{x-1}}$
35. $\int \frac{dx}{\sqrt{1-4x}}$
36. $\int \frac{\sin^2\theta}{\cos\theta}\,d\theta$
37. $\int \arctan x\,dx$
38. $\int e^{2x}\cos x\,dx$
39. $\int (\ln x)^2\,dx$
40. $\int \frac{dx}{(x^2+9)^2}$
41. $\int \frac{x\,dx}{(x^2+9)^2}$
42. $\int_1^2 \ln x\,dx$
43. $\int x^2 e^{3x}\,dx$
44. $\int \cos(\ln x)\,dx$
45. $\int \frac{x\,dx}{\sqrt{1-4x^2}}$
46. $\int \frac{x^5}{\sqrt{x^2+9}}\,dx$
47. $\int_0^{1/4} \frac{dx}{\sqrt{1-4x^2}}$
48. $\int \frac{\arcsin(2t)}{\sqrt{1-4t^2}}\,dt$
49. $\int \frac{\sqrt{4x^2-9}}{x}\,dx$
50. $\int \frac{4x-3}{x^2+16}\,dx$
51. $\int \frac{x^3}{\sqrt{25-x^2}}\,dx$
52. $\int \frac{\tan\theta+\cos\theta+1}{\sin\theta}\,d\theta$
53. $\int x\,e^{x^2/2}\,dx$
54. $\int x\operatorname{arcsec} x\,dx$
55. $\int_{\frac{1}{\sqrt{2}}}^{1} \arccos x\,dx$
56. $\int \frac{\tan(\sqrt{x})\,\sec^2(\sqrt{x})}{\sqrt{x}}\,dx$

Differentiate:

1. $y = x^2\arctan(x^3-1)$
2. $y = \frac{\arccos\sqrt{x}}{\sqrt{x+1}}$
3. $y = \sin^{-1}(1-x^2) + \csc^{-1}\left(\frac{x}{5}\right)$
4. $y = \operatorname{arcsec}(x^2+1)$
5. $y = \sin(x)\operatorname{arccot}(x)$
6. $y = \arctan\left(\sqrt{x^2-1}\right) + \arcsin\left(\frac{1}{x}\right)$

Simplify: (*i.e.* no trig!)

1. $\cos\left(\arcsin\frac{x}{2}\right)$
2. $\sec\left(\arccos\left(\frac{1}{x}\right)\right)$
3. $\sin\left(\arctan\left(\frac{x}{3}\right)\right)$
4. $\sec\left(\operatorname{arccsc}\left(\frac{x+1}{5}\right)\right)$