Differentiate the following functions.

Time spent getting good at this again will save you lots of time later.

Using the Product Rule & Quotient Rule:

1. $x \cdot \sin(x)$
2. $x \cdot \cos(x)$
3. $x^2 \cdot \sin(x)$
4. $x^3 \cdot \sin(x)$
5. $x^3 \cdot \cos(x)$
6. $\sin(x) \cdot \cos(x)$
7. $(x^2 + 3) \cdot \sin(x)$
8. $\sqrt{x} \cdot \cos(x)$
9. $\frac{1}{x} \cdot \sin(x)$
10. $x \cdot e^x$
11. $x^3 \cdot \ln(x)$
12. $\frac{1}{x} \cdot e^x$
13. $\sin(x) \cdot \sin(x)$
14. $\cos(x) \cdot \cos(x)$
15. $e^x \cdot e^x$
16. $\sqrt{x} \cdot (x^3 - 5)$
17. $\frac{\sin(x)}{x}$
18. $\frac{\sin(x)}{x^3}$
19. $\frac{\cos(x)}{x^2}$
20. $\frac{x^2 + 3}{x - 2}$
21. $\frac{x + 5}{x - 3}$
22. $\tan(x)$
23. $\sec(x)$
24. $\arctan(x)$
25. $\frac{1 + \sin(x)}{x}$
26. $x^2 \cdot \arctan(x)$
27. $\frac{x}{2 + \sin(x)}$
28. $\arcsin(x)$
29. $\frac{e^x}{x}$
30. $\frac{\ln(x)}{x + 1}$
31. $\arctan(x) \cdot \ln(x)$
32. $\frac{x^2 + 3x - 2}{x + 5}$

Using the Chain Rule:

33. $\sin(5x + 2)$
34. $\sin^5(x^2 + 3)$
35. $\sin(\sqrt{x})$
36. $\sin(\frac{1}{x})$
37. $\cos^4(3x - 1)$
38. $\cos(x^3 + 7x)$
39. $\cos(\sqrt{x})$
40. $\cos^7(e^x)$
41. $\tan(x^3)$
42. $\sin(e^x)$
43. $\sin(\cos(x))$
44. $\cos(\frac{1}{x^2})$
45. $e^{(5x + 4)}$
46. $e^{\sin(x)}$
47. $e^{(7x - 1)}$
48. $e^{1/x}$
49. $e^{\tan(x)}$
50. $e^{(x^2)}$
51. $\ln(3x + 7)$
52. $\ln(x^2 + 3)$
53. $\ln(\sin(x))$
54. $\ln(2 + \sqrt{x})$
55. $\ln(\tan(x))$
56. $\ln(1 + x^2)$
57. $\ln(7 - \cos(x))$
58. $(5x + 3)^3$
59. $(4x - 1)^5$
60. $\arctan(e^x)$
61. $(x^2 + 3)^7$
62. $(e^x + x)^5$
63. $\ln(\arctan(x))$
64. $\arcsin(x^3 + 5)$
65. $\arcsin^5(x)$
66. $\arctan(\ln(x))$
67. $e^{\arctan(x)}$
68. $\sqrt{x^3 + \arctan(x)}$
69. $\sqrt{10 - x^2}$
70. $1/\sqrt{x^3 + 5}$
71. $\sqrt{3 + \ln(x)}$
72. $\sqrt{e^x - \sin(x)}$