

# MAT220 Handout Spring 2006 Derivative Review Sheet

Think of  $\frac{dy}{dx}$  as  $r_y(x)$  or as  $r_x(y)$  where  $y = f(x)$ .

Find the derivatives  $\left(\frac{dy}{dx}\right)$  of each of the following functions.

1.  $y = 5x^2 - 5\sqrt{x} - \frac{3}{x}$

2.  $y = x^2 2^x + \pi^2$

3.  $y = \frac{\sqrt{x}}{\sqrt{x} - 1}$

4.  $y = \left(\frac{\cos x}{1 - \sin x}\right)^2$

5.  $y = (17x^2 - 5x)^{50}$

6.  $y = e^{2x} \sin(3x)$

7.  $y = \ln(\ln x) + e^{x^2}$

8.  $y = \sqrt{10^{5-x}}$

9.  $y = \sqrt{\sin x}$

10.  $y = (x^2 + 1) \arctan x$

11.  $y = \ln\left(\frac{1}{x}\right) + 1$

12.  $y = \frac{2}{1 - x^2}$

13.  $y = \arcsin(x^2)$

14.  $y = \ln(\cos x)$

15.  $y = \cos^3(\sqrt{x})$

16.  $y = \ln(x) \cos(x)$

17.  $y = x(\ln(x) - x)$

18.  $y = e^{\ln x^2} - 3x^{-7}$

19.  $y = mx + b$  ( $m$  and  $b$  constant)

20.  $y = \frac{\tan x}{x^2 - 1}$

21.  $y = [\arccos(x)]^3$

22.  $y = \frac{2}{3} x^{(3-e)}$

23.  $y = \arctan(e^x)$

24.  $y = \frac{e^x + e^{-x}}{2}$

25.  $y = (\sin x)e^x$

26.  $y = \frac{2}{e^x + e^{-x}}$

27.  $y = (ax)\tan(bx)$  ( $a$  and  $b$  constant)

28.  $y = \frac{1}{1 - e^{-x}}$

29.  $f(x) = \frac{e^x}{x}$

30.  $2xy + 2y^2 = x$

31.  $y = A \sin(Bx - C) + D$   
( $A, B, C$  and  $D$  constant)

32.  $y = \sin(\sqrt{x})$

33.  $y = 6x^{-\frac{3}{2}} + 7x^{\frac{1}{5}} + 1$

34.  $y = 3\cos(5x) + 3\sin(x^9)$

35.  $y = \frac{4}{3} \cdot 3^{x^2 - x}$

36.  $y = 5^x + 3x^7$

37.  $y = \tan(6x)$

38.  $y = \arctan(-5x)$

39.  $y = \sqrt{2x} + \frac{1}{x^2} + \pi$

40.  $y = \frac{1}{2} \ln(x^2 - x)$

41.  $y = \frac{1}{2} \cos x - \frac{1}{3} \sin x$

42.  $y = 2^x + 3 \ln x$

43.  $y = \tan(3)e^x$

44.  $y = \frac{\sin^2 x + \cos^2 x}{x}$

45.  $y = \frac{\sin(2x)}{\cos(2x)}$

46.  $y = \frac{\sin x}{x^2}$

47.  $y = \tan(\sin x) + \frac{1}{\pi}$

48.  $2y = x^2 + \sin y$

49.  $y = \sin^3(3x^2 - 2x + 1)$

50.  $y = x^2 \tan\left(\frac{1}{x}\right)$
51.  $y = 4x^3 - 2\sqrt{x} - \frac{4}{x}$
52.  $y = x^3 3^x + e^2$
53.  $y = \frac{\sqrt{2x}}{\sqrt{2x+5}}$
54.  $y = \left(\frac{1 + \cos x}{\sin x}\right)^2$
55.  $y = (3x^2 - x)^{10}$
56.  $y = e^{3x} \cos(2x)$
57.  $y = \ln(\ln x) + e^{\sin x}$
58.  $y = \frac{1}{3x}$
59.  $y = \sqrt{\cos x}$
60.  $y = (1 - x^2) \arctan x$
61.  $y = \ln\left(\frac{2}{x^2}\right) + 3$
62.  $y = \frac{-7}{1 - x^3}$
63.  $y = \arccos(x^3)$
64.  $y = \ln(\sin x)$
65.  $y = \sin^2(\sqrt{x})$
66.  $y = (\sin x) \ln x$
67.  $y = x^2(x - \ln x)$
68.  $y = \ln e^{x^2} - 4x^{-6}$
69.  $y = cx + d$  ( $c$  and  $d$  constant)
70.  $y = \frac{\tan x}{4 - x^2}$
71.  $y = [\arcsin(x)]^4$
72.  $y = \frac{4}{3} x^{\left(\frac{3}{4} - \pi\right)}$
73.  $y = \arctan(\ln x)$
74.  $y = \frac{1}{2}(e^x - e^{-x})$
75.  $y = (\cos x) e^x$
76.  $y = \frac{e}{e^x - e^{-x}}$
77.  $y = bx \tan(cx)$  ( $b$  and  $c$  constant)
78.  $y = \frac{4}{3 - 2e^{-x}}$
79.  $f(x) = \frac{x}{e^x}$
80.  $4xy - 3y^2 = 2x$
81.  $y = A \cos(Bx - C)$   
( $A$ ,  $B$ ,  $C$  and  $D$  constant)
82.  $y = \cos(\sqrt{x})$
83.  $y = \frac{4}{3} x^{-\frac{3}{4}} + 6 x^{\frac{1}{6}} + 7$
84.  $y = 4 \sin(10x) - 3 \sin(x^7)$
85.  $y = \ln(3) 3^{(2x-x^3)} + e^2$
86.  $y = 4^x - 7x^3$
87.  $y = \tan(6x^2 - 1)$
88.  $y = \arctan(-2x)$
89.  $y = \sqrt{3x} + \frac{1}{x^3} + \pi$
90.  $y = 3 \ln(4x - x^3)$
91.  $y = \frac{1}{2} \cos x - \frac{1}{3} \sin x$
92.  $y = 3^x + 2 \ln x$
93.  $y = \sin(3) e^x$
94.  $y = \frac{\sec^2 x - \tan^2 x}{x}$
95.  $y = \frac{\cos(3x)}{\sin(3x)}$
96.  $y = \frac{\cos x}{x^3}$
97.  $y = \sin(\sin x) + \frac{1}{e}$
98.  $3y = x^3 + \cos y$
99.  $y = \cos^2(3x^2 - 7x)$
100.  $y = x^3 \sin\left(\frac{1}{x}\right)$
101.  $y = 7x^2 - 3\sqrt{x} + \frac{2}{x}$
102.  $y = x^4 4^x + 4x$
103.  $y = \frac{\sqrt{5x+1}}{\sqrt{5x}}$
104.  $y = \left(\frac{\cos x}{3 + \sin x}\right)^3$

105.  $y = (x^2 - 3x)^{25}$
106.  $y = e^{10x} \sin(20x)$
107.  $y = 4\ln(\ln x) + e^{x^3}$
108.  $y = \frac{1}{7x}$
109.  $y = \sqrt{\sin x - 1}$
110.  $y = (x^3 + x) \arctan x$
111.  $y = \ln\left(\frac{1}{x^3}\right) + \ln(e)$
112.  $y = \frac{2}{x^4 - 3}$
113.  $y = \arccos(x^3)$
114.  $y = \ln(x + \sin x)$
115.  $y = \cos^4(\sqrt{x})$
116.  $y = \tan(x) \ln(x)$
117.  $y = x^2(\ln(x) - x^2)$
118.  $y = e^{\ln(x^3)} - 4x^{-2}$
119.  $y = k_1x + k_2$  ( $k_1$  and  $k_2$  constant)
120.  $y = \frac{\tan x}{2x - 1}$
121.  $y = [\arcsin(x)]^7$
122.  $y = 2x^{\left(\frac{1}{2}\right)^{-e}}$
123.  $y = \arccos(\ln x)$
124.  $y = \frac{e^x + e^{-x}}{e}$
125.  $y = (\sin x)e^x + \pi^2$
126.  $y = \frac{\pi}{e^x + e^{-x}}$
127.  $y = (k_1x) \tan(k_2x)$  ( $k_1$  and  $k_2$  constant)
128.  $y = \frac{4}{e^{-x} + 4}$
129.  $y = \frac{e^x}{1-x}$
130.  $3xy - 4y^2 = 2x$
131.  $y = a \cos(bx + c) + d$   
( $a, b, c$  and  $d$  constant)
132.  $y = \tan \sqrt{x}$
133.  $y = 4x^{-\frac{1}{5}} + 6x^{\frac{2}{7}} + 4$
134.  $y = 10\sin(-2x) + 4\cos(x^3)$
135.  $y = \ln(2) 2^{x^3-x} + e^2$
136.  $y = 10^x + 10x^{10}$
137.  $y = \cos(-4x)$
138.  $y = \arctan(0.2x)$
139.  $y = \sqrt{10x} + \frac{4}{x^3} - e$
140.  $y = \frac{1}{3} \ln(3x - 2x^3)$
141.  $y = \frac{1}{7} \sin x - \frac{1}{6} \cos x$
142.  $y = 5^x + 2 \ln x$
143.  $y = \sin(2)e^x$
144.  $y = \frac{\csc^2 x - \cot^2 x}{x}$
145.  $y = \frac{\sin(9x)}{\cos(9x)}$
146.  $y = \frac{\cos x}{x^7}$
147.  $y = \sin(\tan x) + \frac{1}{7}$
148.  $3y = 2x^2 + \cos y$
149.  $y = \cos^2(1 - 2x + x^2)$
150.  $y = 4x^5 \tan\left(\frac{-1}{x}\right)$