

4.  $y = \frac{3x-2}{\sqrt{2x+1}} \Rightarrow$   
 $y' = \frac{\sqrt{2x+1}(3) - (3x-2)\frac{1}{2}(2x+1)^{-1/2}(2)}{(\sqrt{2x+1})^2} \cdot \frac{(2x+1)^{1/2}}{(2x+1)^{1/2}} = \frac{3(2x+1) - (3x-2)}{(2x+1)^{3/2}} = \frac{3x+5}{(2x+1)^{3/2}}$
5.  $y = 2x\sqrt{x^2+1} \Rightarrow$   
 $y' = 2x \cdot \frac{1}{2}(x^2+1)^{-1/2}(2x) + \sqrt{x^2+1}(2) = \frac{2x^2}{\sqrt{x^2+1}} + 2\sqrt{x^2+1} = \frac{2x^2 + 2(x^2+1)}{\sqrt{x^2+1}} = \frac{2(2x^2+1)}{\sqrt{x^2+1}}$
6.  $y = \frac{e^x}{1+x^2} \Rightarrow y' = \frac{(1+x^2)e^x - e^x(2x)}{(1+x^2)^2} = \frac{e^x(x^2-2x+1)}{(1+x^2)^2} = \frac{e^x(x-1)^2}{(1+x^2)^2}$
7.  $y = e^{\sin 2\theta} \Rightarrow y' = e^{\sin 2\theta} \frac{d}{d\theta}(\sin 2\theta) = e^{\sin 2\theta}(\cos 2\theta)(2) = 2\cos 2\theta e^{\sin 2\theta}$
8.  $y = e^{-t}(t^2 - 2t + 2) \Rightarrow$   
 $y' = e^{-t}(2t-2) + (t^2-2t+2)(-e^{-t}) = e^{-t}(2t-2-t^2+2t-2) = e^{-t}(-t^2+4t-4)$
9.  $y = \frac{t}{1-t^2} \Rightarrow y' = \frac{(1-t^2)(1) - t(-2t)}{(1-t^2)^2} = \frac{1-t^2+2t^2}{(1-t^2)^2} = \frac{t^2+1}{(1-t^2)^2}$
10.  $y = \sin^{-1}(e^x) \Rightarrow y' = \frac{1}{\sqrt{1-(e^x)^2}} \cdot e^x = e^x / \sqrt{1-e^{2x}}$
11.  $y = xe^{-1/x} \Rightarrow y' = xe^{-1/x}(1/x^2) + e^{-1/x} \cdot 1 = e^{-1/x}(1/x+1)$
12.  $y = x^r e^{sx} \Rightarrow y' = x^r(se^{sx}) + e^{sx}(rx^{r-1}) = e^{sx}x^{r-1}(sx+r)$
13.  $\frac{d}{dx}(xy^4+x^2y) = \frac{d}{dx}(x+3y) \Rightarrow x \cdot 4y^3y' + y^4 \cdot 1 + x^2 \cdot y' + y \cdot 2x = 1 + 3y' \Rightarrow$   
 $y'(4xy^3+x^2-3) = 1-y^4-2xy \Rightarrow y' = \frac{1-y^4-2xy}{4xy^3+x^2-3}$
14.  $y = \ln(\csc 5x) \Rightarrow y' = \frac{1}{\csc 5x}(-\csc 5x \cot 5x)(5) = -5 \cot 5x$
15.  $y = \frac{\sec 2\theta}{1+\tan 2\theta} \Rightarrow$   
 $y' = \frac{(1+\tan 2\theta)(\sec 2\theta \tan 2\theta \cdot 2) - (\sec 2\theta)(\sec^2 2\theta \cdot 2)}{(1+\tan 2\theta)^2} = \frac{2\sec 2\theta [(1+\tan 2\theta)\tan 2\theta - \sec^2 2\theta]}{(1+\tan 2\theta)^2}$   
 $= \frac{2\sec 2\theta (\tan 2\theta + \tan^2 2\theta - \sec^2 2\theta)}{(1+\tan 2\theta)^2} = \frac{2\sec 2\theta (\tan 2\theta - 1)}{(1+\tan 2\theta)^2} [1+\tan^2 x = \sec^2 x]$
16.  $\frac{d}{dx}(x^2 \cos y + \sin 2y) = \frac{d}{dx}(xy) \Rightarrow x^2(-\sin y \cdot y') + (\cos y)(2x) + \cos 2y \cdot 2y' = x \cdot y' + y \cdot 1 \Rightarrow$   
 $y'(-x^2 \sin y + 2 \cos 2y - x) = y - 2x \cos y \Rightarrow y' = \frac{y - 2x \cos y}{2 \cos 2y - x^2 \sin y - x}$
17.  $y = e^{cx}(c \sin x - \cos x) \Rightarrow$   
 $y' = e^{cx}(c \cos x + \sin x) + ce^{cx}(c \sin x - \cos x)$   
 $= e^{cx}(c^2 \sin x - c \cos x + c \cos x + \sin x) = e^{cx}(c^2 \sin x + \sin x) = e^{cx} \sin x (c^2 + 1)$
18.  $y = \ln(x^2 e^x) = \ln x^2 + \ln e^x = 2 \ln x + x \Rightarrow y' = 2/x + 1$
19.  $y = \log_5(1+2x) \Rightarrow y' = \frac{1}{(1+2x) \ln 5} \frac{d}{dx}(1+2x) = \frac{2}{(1+2x) \ln 5}$