Section 3.6

9.) $y = (2x+1)^5 \xrightarrow{D} y' = 5(2x+1)^4 \cdot 2$

15.) $y = \sec(\tan x) \xrightarrow{D}$

$y' = \sec(\tan x)\tan(\tan x) \cdot \sec^2 x$

17.) $y = \sin^3 x = (\sin x)^3 \xrightarrow{D}$

$y' = 3\sin^2 x \cdot \cos x$

22.) $y = e^{(4\sqrt{x} + x^2)} \xrightarrow{D}$

$y' = e^{(4\sqrt{x} + x^2)} \cdot (4 \cdot \frac{1}{2} x^{-1/2} + 2x)$

33.) $y = (4x+3)^4 (x+1)^{-3} \xrightarrow{D}$

$y' = (4x+3)^4 \cdot -3(x+1)^{-4} + 4(4x+3)^3 \cdot (4) \cdot (x+1)^{-3}$

36.) $y = (1+2x) \cdot e^{-2x} \xrightarrow{D}$

$y' = (1+2x) \cdot e^{-2x} \cdot (-2) + (2) \cdot e^{-2x}$

40.) $k(x) = x^2 \cdot \sec(\frac{1}{x}) \xrightarrow{D}$

$k'(x) = x^2 \cdot \sec(\frac{1}{x})\tan(\frac{1}{x}) \cdot -\frac{1}{x^2}$

$+ 2x \cdot \sec(\frac{1}{x})$

43.) $f(\theta) = \left(\frac{\sin\theta}{1+\cos 2\theta}\right)^2 \xrightarrow{D}$

$f'(\theta) = 2\left(\frac{\sin\theta}{1+\cos 2\theta}\right) \cdot \frac{(1+\cos 2\theta)\cdot\cos\theta - \sin\theta\cdot(-\sin\theta)}{(1+\cos 2\theta)^2}$

48.) $q = \cot\left(\frac{\sin t}{t}\right) \xrightarrow{D}$

$q' = -\csc^2\left(\frac{\sin t}{t}\right) \cdot \frac{t\cdot\cos t - \sin t\cdot(1)}{t^2}$

50.) $Y = \theta^3 \cdot e^{-2\theta} \cdot \cos 5\theta \xrightarrow{D}$ (triple product rule)

$Y' = \underline{3\theta^2}\cdot e^{-2\theta}\cdot\cos 5\theta + \theta^3\cdot\underline{-2e^{-2\theta}}\cdot\cos 5\theta$
$+ \theta^3\cdot e^{-2\theta}\cdot\underline{-5\sin 5\theta}$

58.) $Y = \left(e^{\sin(t/2)}\right)^3 \xrightarrow{D}$

$Y' = 3\left(e^{\sin(t/2)}\right)^2 \cdot e^{\sin(t/2)}\cdot\cos(t/2)\cdot 1/2$

61.) $Y = \sin(\cos(2t-5)) \xrightarrow{D}$

$Y' = \cos(\cos(2t-5))\cdot -\sin(2t-5)\cdot(2)$

63.) $Y = (1+\tan^4(t/12))^3 \xrightarrow{D}$

$Y' = 3(1+\tan^4(t/12))^2\cdot 4\tan^3(t/12)\cdot\sec^2(t/12)\cdot\frac{1}{12}$

66.) $Y = 4\sin\sqrt{1+\sqrt{t}} \xrightarrow{D}$

$y' = 4\cdot\cos\sqrt{1+\sqrt{t}}\cdot\frac{1}{2}(1+\sqrt{t})^{-1/2}\cdot\frac{1}{2}t^{-1/2}$

71.) $y = \left(1+\frac{1}{x}\right)^3$ $\xrightarrow{D}$

$y' = 3\left(1+\frac{1}{x}\right)^2 \cdot \frac{-1}{x^2} = 3\left(\frac{x+1}{x}\right)^2 \cdot \frac{-1}{x^2}$

$= \frac{-3(x+1)^2}{x^2 \cdot x^2} = \frac{-3(x+1)^2}{x^4}$ $\xrightarrow{D}$

$y'' = \frac{x^4 \cdot -6(x+1) - -3(x+1)^2 \cdot 4x^3}{x^8}$

$= \frac{-6x^3(x+1)\cdot[x-2(x+1)]}{x^8}$

$= \frac{-6(x+1)[-x-2]}{x^5}$

$= \frac{6(x+1)[x+2]}{x^5}$

74.) $y = 9\tan(x/3)$ $\xrightarrow{D}$

$y' = 9 \cdot \sec^2(x/3) \cdot 1/3 = 3\sec^2(x/3)$ $\xrightarrow{D}$

$y'' = 3 \cdot 2\sec(x/3) \cdot \sec(x/3)\tan(x/3) \cdot 1/3$

$= 2\sec^2(x/3)\tan(x/3)$

77.) $y = e^{x^2} + 5x$ $\xrightarrow{D}$

$y' = 2xe^{x^2} + 5$ $\xrightarrow{D}$

$y'' = 2x \cdot 2xe^{x^2} + (2) \cdot e^{x^2} + 0$

$= 4x^2e^{x^2} + 2e^{x^2}$

$= 2e^{x^2}(2x^2+1)$

89.) $S = \cos\theta$; assume θ is a function of t so that

$$\frac{dS}{dt} = \frac{d}{dt}(\cos\theta)$$

$$= -\sin\theta \cdot \frac{d\theta}{dt} \quad ;$$

if $\theta = \frac{3\pi}{2}$, then

$$\frac{dS}{dt} = -\sin\left(\frac{3\pi}{2}\right) \cdot (5)$$

$$= -(-1) \cdot (5)$$

$$= 5$$