3-4

7. $\frac{d}{dx}(x^4+3x^2-2)^5 = 5(x^4+3x^2-2) \cdot (4x^3+6x)$

8. $100(4x-x^2) \cdot (4-2x)$

9. $\frac{1}{2}(\sqrt{1-2x})^{-.5} \cdot -2$

10. $\cancel{\frac{(1+\sec x)^2 - (\sec x \tan x)\cdot 1}{(1+\sec x)^2}}$

$\frac{d}{dx}(1+\sec x)^{-2} = -2(1+\sec x)^{-3} \cdot (0+\sec x \tan x)$

11. $\frac{d}{dz}(z^2+1)^{-1} = -1(z^2+1)^{-2} \cdot 2z$

12. $\frac{d}{dt} \sin(e^t) + e^{\sin t} = \cos(e^t) \cdot e^t + e^{\sin t} \cdot \cos t$

13. $y = \cos(a^3+x^3) = -\sin(a^3+x^3) \cdot (3a^2+3x^2)$

14. $3n^2 + 3\cos^2 x \cdot -\sin x$

15. $y = xe^{-kx} = e^{-kx} \cdot x + 1 \cdot e^{-kx}$

16. $= \cancel{(x+1)e^{(-k+1)(x)}(-k)}$

$(-\sin 4t)(e^{-2t}) + (e^{-2t})(\cos 4t)$

17. $f(x) = (2x-3)^4 \cdot (x^2+x+1)^5$

$= 8(2x-3)^3(x^2+x+1)^5 + 5(2x-3)^4(2x+1)(x^2+x+1)^4$

$= (2x-3)^3(x^2+x+1)^4(28x^2-12x-7)$

18.

$(x^2+1)^3(x^2+2)^6$

$6(x^2+2)(x^2+1)^3 \cdot 2x + 3(x^2+1)(x^2+2)^6 \cdot 2x$

19. $(t+1)^{\frac{2}{3}}(2t^2-1)^3 = 3(2t^2-1)(t+1)^{\frac{2}{3}}(4t) + \frac{2}{3}(t+1)$
$(2t^2-1)(1)$

20. $-3(2t^2-1)^{-4}(3t-1)^4(4t) + 4(3t-1)^3(2t^2-1)^{-3}(3)$

21. $((x^2+1)(x^2-1)^{-1})^{-3} = -3(x^2+1)(x^2-1)^{-1} \cdot -1(x^2-1)^{-2}(x^2+1)$
$4(2x)$
$+2x(x^2-1)^{-1}$

22. $\cancel{\sqrt{(s^2+1)} \cdot \sqrt{(s^2+4)}}$

$\frac{1}{2}(x^2+1)^{-.5} \cdot \sqrt{s^2+4} \cdot 2x - \sqrt{x^2+1} \cdot \frac{1}{2}(x^2+4)^{-.5} \cdot x^3$

23. $\frac{d}{dx} 10^{1-x^2} = (1-x^2)10^{-x^2} \cdot -2x$

24. $\frac{d}{dx} 5^{-1/x} = -x^{-1} \cdot 5^{-x^{-1}-1} \cdot -1(x)^{-2}$

27. $\frac{r}{\sqrt{r^2+1}}$ $\quad \sqrt{r^2+1} - .5(r^2+1)^{-.5} \cdot 2r \cdot r$

28. $\frac{e^v - e^{-v}}{e^v + e^{-v}}$ $\quad (e^v - e^{-v})(e^v + e^{-v}) - (e^v + e^{-v})(e^v - e^{-v})$

$\cdot (e^x - e^{vx} \cdot -1) \qquad (e^x + e^{x} \cdot -1)$

29. $e^{t \sin 2t} = e^{t \sin 2t} \cdot \frac{d}{dt}(t \cdot \sin 2t)$

$= e^{t \sin t} \cdot (t \cos 2t + \sin 2t)$

30. $\left(\frac{v}{v^3+1}\right)^6 = 6\left(\frac{v}{v^3+1}\right)^5 \cdot \frac{d}{dv}\left(\frac{v}{v^3+1}\right)$

$= 6\left(\frac{v}{v^3+1}\right)^5 \cdot \frac{v^3+1-3v^3}{(v^3+1)^2}$

31.

$\cancel{\sin}$ $\cos(\tan 2t) \cdot \sec^2 2x \cdot 2$

51.

$10(1+2x)^9 \cdot 2$

$20(1)^9 = 20$

$y = 20x + 1$

53

$.5(1+x^3)^{-.5} \cdot 3x^2$

$.5\left(\frac{1}{3}\right) \cdot 3 \cdot 2^2$

$= 2$

~~$y = x + 1$~~

$y = 2x - 1$

63,

a. $5 \cdot 6 = 30$

b. $9 \cdot 4 = 36$

65,

how to find

$f'(3)$?

5. $x^3 + y^3 = 1$

$$\frac{d}{dx}x^3 + \frac{d}{dx}y^3 = \frac{d}{dx}1$$

$$3x^2 + 3y^2 \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} = -\frac{x^2}{y^2}$$

6. $2x^{.5} + y^{.5} = 3$

$$\frac{dy}{dx} = \frac{2\sqrt{y}}{\sqrt{y}}$$

$$x^{-.5} + \frac{1}{2}y^{-.5}\frac{dy}{dx} = 0$$

7. $x^2 + xy - y^2 = 4$

$$2x + y + \frac{dy}{dx}\cdot x - 2y\cdot\frac{dy}{dx} = 0$$

$$-2x - y = \frac{dy}{dx}(x - 2y)$$

$$\frac{dy}{dx} = \frac{-2x - y}{x - 2y}$$

8. $2x^3 + x^2y - xy^3 = 2$

$$6x^2 + 2xy + \frac{dy}{dx}x^2 - y^3 - xy^2\frac{dy}{dx} = 0$$

$$-6x^2 - 2xy = \frac{dy}{dx}(x^2 - xy^2) - y^3$$

$$\frac{y^3 - 6x^2 - 2xy}{x^2 - xy^2} = \frac{dy}{dy}$$

9. $x^4(x+y) = y^2(3x-y)$

$$(1+\frac{dy}{dx})(x^4) + 4x^3(x+y) = (3-\frac{dy}{dx})(y^2) + (y\frac{dy}{dx})(3x-y)$$

$$(1+\frac{dy}{dx}) = \frac{(3-\frac{dy}{dx})(y^2) + (y\frac{dy}{dx})(3x-y) - 4x^3(x+y)}{x^4}$$

10.

$xe^y = x-y$

$e^y + \cancel{\frac{dy}{dx}} x = \cancel{1-\frac{dy}{dx}}$

$e^y \cdot x\frac{dy}{dx} = 1 - \frac{dy}{dx}$

$e^y \cdot x\frac{dy}{dx} - 1 = -\frac{dy}{dx}$

$\frac{dy}{dy} = -\frac{ey-1}{xey+1}$

11.

$y\cos x = x^2 + y^2$

$\frac{dy}{dx}\cos x - y\sin y = 2x + 2y + \frac{dy}{dx}y$

$\frac{dy}{dx}\cos x - \frac{dy}{dx}y = 2x + 2y + y\sin x$

$\frac{dx}{dy}(\cos x - y) = 2x + 2y + y\sin x$

$\frac{dy}{dx} = \frac{2x+2y+y\sin x}{\cos x - y}$

12.

$\cos(xy) = 1 + \sin y$

$-\sin(xy) + y + \frac{dy}{dx}x$

$= \cos y + \frac{dy}{dx}$

$= -\cos y - \sin xy = \frac{dy}{dx} - \frac{dy}{dx}x$

$\frac{dy}{dx} = \frac{-\cos y - \sin xy}{1-x}$

$y\sin 2x = x\cos 2y$

$\frac{dy}{dx}\sin 2x + (2\cos x)y = \cos 2y - 2x\frac{dy}{dx}\sin(2y)$

$= \frac{dy}{dx}\sin 2x \quad \frac{dy}{dx} = \frac{\cos 2y - 2\cos(2x)y}{\sin 2x + 2x\sin 2y}$

$\frac{dy}{dx} = \frac{\cos\frac{\pi}{2} - 2\cdot\cos\pi\cdot\pi/4}{4\pi\cdot\sin\frac{\pi}{2} + \sin\pi} = \frac{0+2\cdot\pi/4}{\pi+0}$

$.5\frac{\pi}{\pi} = .5x$

26. $\sin(x+y) = 2x-2y$

$\cos(x+y) + 1 + \frac{dy}{dx} = 2 - 2\frac{dy}{dx}$

$-3\frac{dy}{dx} = -1 + \cos(x+y)$

$\frac{dy}{dx} = 3x - 3\cos(x+y)$

$\frac{dy}{dx} = 3-3$

$y = \pi$

27

$x^2 + xy + y^2 = 3$

$2x + y + xy' + 2yy' = 0$

$-(2x+y) = 2y \cdot y' + x \cdot y'$

$y' = \frac{-(2x+y)}{2y+x}$

$\cancel{y'}$ = tangent line = x

35.

$9x^2 + y^2 = 9$

$18x + 2yy' = 0$

$y' = \frac{-18x}{2y}$ $\quad y'' = \frac{-18 \cdot 2y - y' \cdot -18x}{(2y)^2}$

$y'' = \frac{-36y + 18xy'}{4y^2} = \frac{-36y + 18x \cdot \frac{-18x}{2y}}{4y^2}$

31

$\sqrt{x} + \sqrt{y} = 1$

$\frac{1}{2\sqrt{x}} + \frac{1}{2\sqrt{y}} \cdot y' = 0$

$y' = \frac{-2\sqrt{y}}{2\sqrt{x}}$

$y'' = \frac{-y^{.5} \cdot \left(\frac{-2\sqrt{y}}{2\sqrt{x}}\right) \cdot 2\sqrt{x} - x^{-.5} \cdot -2\sqrt{y}}{(2\sqrt{x})^2}$

$y'' = \frac{-y^{-.5} \cdot y' \cdot 2\sqrt{x} - +x^{-.5} \cdot -2\sqrt{y}}{(2\sqrt{x})^2}$

49. $(\arctan^2 x) = 2\arctan x \cdot \frac{1}{x^2+1}$

50. $\arctan(x^2) = \frac{1}{x^4+1} \cdot 2x$

51. $\arcsin(2x+1) = \frac{1}{\sqrt{(2x+1)^2+1}} \cdot 2$

52. $\sqrt{x^2-1} \cdot \operatorname{arcsec} x$

$\frac{1}{x\sqrt{x^2-1}} \cdot \sqrt{x^2-1} + \frac{1}{2\sqrt{x^2-1}} \cdot 2 \cdot \operatorname{arcsec} x$

53. $\sqrt{1-x^2} \arccos x = \frac{-1}{\sqrt{1-x^2}} \cdot \sqrt{1-x^2} + \frac{1}{2\sqrt{1-x^2}} \cdot -2 \cdot \arccos x.$

54 $\arctan(x-\sqrt{1+x^2}) = \frac{-1}{(x-\sqrt{1+x^2})^2+1} \cdot \left(1-\left(\frac{1}{2\sqrt{1+x^2}} \cdot 2\right)\right)$

~~55.~~

5.5 $\operatorname{arccot}(t) + \operatorname{arccot}(\frac{1}{t})$

$\frac{-1}{t^2+1} + \frac{-1}{(\frac{1}{t})^2+1}$

56. $\frac{d}{d\theta} \arcsin(\sqrt{\sin\theta}) = \frac{1}{\sqrt{1-(\sqrt{\sin\theta})^2}} \cdot \frac{1}{2\sqrt{\sin\theta}} \cdot \cos(\theta)$

57.

58 $\arccos(\arcsin(t)) = \frac{-1}{\sqrt{1-(\arcsin(t))^2}} \cdot \frac{1}{\sqrt{1-t^2}}$