3-1

3. $\frac{d}{dx} 2^{40} = 40 \cdot 2^{39}$

4. $\frac{d}{dx} e^5 = e^5$

5. $\frac{d}{dx} 2 - \frac{2}{3} + = \frac{d}{dx} 2 - \frac{d}{dx} \frac{2}{3} +$

$= 0 - \frac{2}{3} \cdot \frac{d}{dx} +$

$= 0 - \frac{2}{3} \cdot 1 = \boxed{-\frac{2}{3}}$

6. $\frac{d}{dx} \frac{3}{4} x^8 = \frac{3}{4} \cdot \frac{d}{dx} x8$

$= \frac{3}{4} \cdot 8 \cdot x^7$

$= \boxed{6x^7}$

7. $\frac{d}{dx} x^3 - 4x + 6 = \frac{d}{dx} x^3 - \frac{d}{dx} 4x - \frac{d}{dx} 6$

$= 3x^2 - 4 - 0 = \boxed{3x^2 - 4}$

8. $1.4 \cdot 5 + t^4 - 2.5 \cdot 2 + t + 0$

$7t^4 - 5t$

9. $\frac{d}{dx} x^2 - 2x^3 = \frac{d}{dx} x^2 - \frac{d}{dx} 2x^3$

$= 2x - 6x^2$

10. $\frac{d}{dx}(x-2)(2x+3) = 2x^2 - x - 6$

$= 4x - 1$

11. $2. \frac{d}{dx} t^{\frac{3}{4}} = \frac{-6}{4} + \frac{-7}{4}$

12. $\frac{d}{dv} cy^{-6} = c \cdot \frac{d}{dy} y^{-6}$

$= -6cy^{-7}$

13. $\frac{d}{dx} - \frac{12}{5^5} = -12 \cdot \frac{d}{dx} \frac{1}{5^5}$

$= -12 \cdot -5 \cdot 5^{-6}$

$= 60 5^{-6}$

14. $\frac{d}{dx} y = x^{5/3} - x^{2/3}$

$\# = \frac{5}{3} x^{\frac{2}{3}} - \frac{2}{3} x^{-1/3}$

15. $\frac{d}{dx}(3a+1)^2 = 6a + 2$

$\frac{d}{dx} 9a^2 + 6a + 1$

$= 18a + 6$

16. $\frac{d}{dx} t + t - 4e^t$

$= t + \frac{3}{4} - 4e^t$

17. $\frac{d}{dx} p^{\frac{1}{2}} - p^1$

$= \frac{1}{2} p^{\frac{-1}{2}} - 1$

18.

$\frac{d}{dx} x\sqrt{x} - \sqrt{x}$

$\frac{d}{dx} x^{\frac{3}{2}} - x^{\frac{1}{2}}$

$\frac{d}{dx} \frac{3}{2} x^{\frac{1}{2}} - \frac{1}{2} x^{\frac{-1}{2}}$

19. $\frac{d}{dx} 3e^x + \frac{4}{x^{\frac{1}{3}}}$

$3e^x + \frac{d}{dx} 4x^{\frac{-1}{3}}$

$3e^x + 4 \cdot \frac{-1}{3} x^{\frac{-4}{3}}$

20.

$\frac{d}{dx} 4 \cdot \pi \cdot r \cdot r$

$4\pi \cdot \frac{d}{dx} r^2$

$= 4\pi \cdot 2r$

21.

$\frac{d}{dx} Av^3 + \frac{d}{dx} Bv^2 + \frac{d}{dx} Cv$

$A \cdot 3v^2 + B \cdot 2v + C$

22.

$\frac{d}{dx}(\sqrt{x} + x)(x^{-2})$

$\frac{d}{dx}(x^{\frac{1}{2}} + x^1)(x^{-2})$

$\frac{d}{dx}(x^{-1.5} + x^{-1})$

$-1.5x^{-2.5} + -x^{-2}$

23.

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

$\frac{d}{dx} x^{1.5} + 4x^{\frac{1}{2}} + 3x^{\frac{-1}{2}}$

$1.5x^{\frac{1}{2}} + 2x^{\frac{-1}{2}} + -1.5x^{\frac{-3}{2}}$

24.

$\frac{d}{dx} \sqrt{2} \cdot v + \sqrt{3v}$

$\sqrt{2} \frac{d}{dx} v + \frac{d}{dx} \sqrt{3v}$

$\sqrt{2} + \frac{1}{2}(3v)^{\frac{-1}{2}}$

25.

$\frac{d}{dx} j(x) = 2.4x^{1.4} + e^{2.4}$

33. $y = x^{\frac{1}{4}}$ $\frac{d}{dx} x^{\frac{1}{4}} = \frac{1}{4}x^{-\frac{3}{4}}$

$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \frac{(x+h)^{\frac{1}{4}} - x^{\frac{1}{4}}}{h}$

$\frac{1}{4x^{\frac{3}{4}}}$, $(1,1)$

$y = \frac{x}{4} + \frac{3}{4}$ $\frac{1}{4} \cdot 1 = \frac{1}{4}$

$1 - \frac{1}{4} = \frac{3}{4}$

34. $\frac{d}{dx} x^4 + 2x^2 - x$

$4x^3 + 4x - 1$

$4 \cdot 1 + 4 \cdot 1 - 1$

$7x - 5$

35. $x^4 + 2e^x$

$4x^3 + 2e^x$

4. $0^3 + 2e^0$

$= 2x + 2$

tangent line $= 2x + 2$

normal $-\frac{1}{2}x + 2$

36. $y^2 = x^4$

$2y = 4x^3$

$2 - 4 = -2$

$t = -2x + 2$

$n = \frac{1}{2}x + 1$

51. $2x^3 + 3x^2 - 12x + 1$ $(-2, 17)$ $(1, -6)$

$f'(x) = 6x^2 + 6x - 12 = 0$

$6(x+2)(x-1)$ $6(x^2 + x - 2) = 0$

52. $\frac{d}{dx} e^x - 2x$

$e^x - 2 = 0$

$e^x = 2$

$x \ln e = \ln 2$

$y = \ln 2$

Section 3-2

3. $\frac{d}{dx}(x^3+2x)(e^x)$

$= (x^3+2x)(e^x) + e^x \frac{d}{dx}(x^3+2x)$

$= (3x^2+2)\cdot(e^x) + (x^3+2x)(e^x)$

$= e^x(x^3+3x^2+2x+2)$

4. $\frac{d}{dx}(\sqrt{x})(e^x)$

$= (\sqrt{x})(e^x) + e^x \frac{d}{dx}\sqrt{x}$

$= (e^x)(\sqrt{x} + \frac{1}{2}x^{-0.5})$

5. $\frac{d}{dx}\frac{x}{e^x}$

$\frac{(x)(e^x)+(e^x)(1)}{(e^x)^2}$

$= \frac{(x+1)(e^x)}{(e^x)(e^x)}$

$= \frac{x+1}{e^x}$

6. $\frac{e^x}{1-e^x}$

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

$= \frac{(e^x)(1-e^x)}{(1-e^x)}$

$= e^x$

7. $\frac{d}{dx}\frac{1+2x}{3-4x}$

$= \frac{(3-4x)(2)+(1+2x)(-4)}{(3-4x)(3-4x)}$

$= -8x-2$

8. $\frac{d}{dx}\frac{x^2-2}{2x+1} = \frac{(2x+1)(\frac{d}{dx}[x^2-2]) - (x^2-2)(\frac{d}{dx}[2x+1])}{(2x+1)(2x+1)}$

$= \frac{(2x+1)(2x-0) - (x^2-2)(2+0)}{(2x+1)(2x+1)}$

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

$= \frac{-x^2+2x+4}{2x+1}$

9. $\frac{d}{dv} v^2 - v = 2v - 1$

10.

	v^3	$-2v$
v^{-4}	v^{-1}	$-2v^3$
v^{-2}	v	$-2v^1$

$= \frac{d}{dv} v - 3v^{-1} - 2v^3$

$= 1 - 3 \cdot -1 v^{-2} - 2 \cdot 3 v^{-4}$

$= 1 + 3v^{-2} + 6v^{-4}$

11. $(y^{-2} - 3y^{-4})(y + 5y^3)$

$= (y+5y^3)\frac{d}{dy}(y^{-2} - 3y^{-4}) + (y^{-2} - 3y^{-4})\frac{d}{dy}(y + 5y^3)$

$= (y+5y^3)(-2y^{-3} + 12y^{-5}) + (y^{-2} - 3y^{-4})(1 + 15y^2)$

12.

	1	$-e^z$
z	z	$-ze^z$
$+e^z$	e^z	$-e^{z^2}$

$\frac{d}{dz} z - ze^z + e^z - e^{z^2}$

$= 1 - ze^z + e^z - e^{z^2}$

13. $\frac{(1-x^2)(3x^2) - x^3(-2x)}{(1-x^2)(1-x^2)}$

14. $\frac{(x^3+x-2)(1) - (x+1)(3x+1)}{(x^3+x-2)(x^3+x-2)}$

15. $\frac{(t^4-3t^2+1)(2t) - (t^2+2)(4t^3-6t)}{(t^4-3t^2+1)(t^4-3t+1)}$

16 $\frac{(t-1)^2(1) - (t)(\frac{2}{2t}t^2-2t+1)}{(t-1)^2(t-1)^2} = \frac{1-(t)(2t-2)}{(t-1)^2}$

17. $e^p(\frac{2}{2\sqrt{p}}p + p\sqrt{p}) + (p+p\sqrt{p})(e^p)$

$= (\frac{3\sqrt{p}}{2}+1)e^p + (p+p\sqrt{p})e^p$

18. $\frac{(5+ke^s)(0) - 1(1+ke^s)}{(5+ke^s)^2} = -\frac{(1+ke^s)}{(5+ke^s)^2}$

19 $\frac{2}{2v}v^2 - 2\sqrt{v} = 2v - v^{.5}$

20. $\frac{2}{2w}w^{5/2} + ce^w w^{\frac{3}{2}} = 2.5w^{1.5} + 1.5ce^w w^{.5}$

49 a. 2 b $\frac{3}{2}$

50. a. 6 b. 5

51. a. $g(x) + x \cdot g'(x)$

52. a. $f(x) \cdot 2x + f(x^2)$

b. $\sqrt{x}(\frac{1}{2}x f(x)) - (1+x f(x))\frac{1}{2}x^{-\frac{1}{2}}$ $\frac{g(x) - x \cdot g'(x)}{[g(x)]^2}$ $\frac{c \cdot g(x) - g(x)}{x^2}$