7.2 P. 311 1a-d, 2, 3a-d, 4-45 4, 5(ace), 7-45(odd)

1. a) $e^4 = 54.59815$ b) $250e = 679.57046$

c) $e^3 - e^2 = 12.69648$ d) $4\sqrt{e} = 6.59489$

2. a) $e^{\ln 23} = 23$ b) $23^{\log_{23} 4} = 4$ c) $\log_8 8^{-7} = -7$ d) $\ln e^{\frac{1}{4}} = \frac{1}{4}$

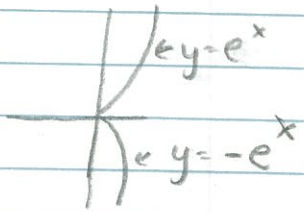
e) $5^{-2\log_5 3} = 5^{\log_5 3^{-2}} = 5^{\log_5 \frac{1}{9}} = \frac{1}{9}$

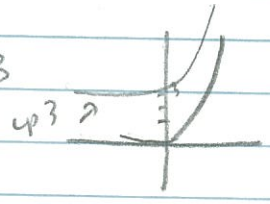
f) $e^{4\ln 3} = e^{\ln 3^4} = 3^4 = 81$

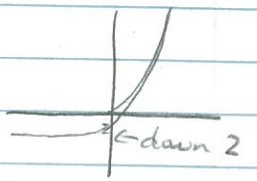
g) $4\ln e^{-3} = 4(-3) = -12$

h) $-2\log_3 3^{-1} = -2(-1) = 2$

3. a) $y = e^{-x}$ 

b) $y = -e^x$ 

c) $y = e^x + 3$ 

d) $y = e^x - 2$ 

4. a) $y = 4^x$; $x = 1$
$y' = 4^x \ln 4 (1)$
$y' = 4^1 \ln 4$
$y' = 5.54518$

b) $y = \left(\frac{1}{2}\right)^x$; $x = 2$
$y' = \left(\frac{1}{2}\right)^x \ln\left(\frac{1}{2}\right)$
$y' = \left(\frac{1}{2}\right)^2 \ln\left(\frac{1}{2}\right)$
$y' = -0.17329$

c) $y = e^{3x}$; $x = -1.5$
$y' = e^{3x} \cdot 3$
$y' = 3e^{3x}$
$y' = 3e^{3(-1.5)}$
$y' = 0.03333$

d) $y = xe^x$; $x = -2$
$y' = (1)e^x + (x)e^x(1)$
$y' = e^x + xe^x = e^x(1+x)$
$y' = e^{-2} + (-2)(e)^{-2} = e^{-2}(1-2)$
$y' = -0.13534$

7.2

5. a) $y = 7^x$
$y' = 7^x \ln 7$

b) $y = 3^{2x+5}$
$y' = 3^{2x+5} \ln 3 (2)$

c) $y = \left(\frac{2}{3}\right)^{x^3-4x}$
$y' = \left(\frac{2}{3}\right)^{x^3-4x} \ln\left(\frac{2}{3}\right)(3x^2-4)$

d) $y = 4(2^{x^3})$
$y' = 4(2^{x^3})(\ln 2)(3x^2)$
$y' = 12x^2(2^{x^3})(\ln 2)$

e) $y = 6(5^{-3x})$
$y' = 6(5^{-3x})(\ln 5)(-3)$
$y' = -18(5^{-3x})(\ln 5)$

f) $y = (2x^4)(5^{3-x})$
$y' = (8x^3)(5^{3-x}) + (2x^4)(5^{3-x})\ln$
$y' = (5^{3-x})(2x^3)[4 - x\ln 5]$

g) $y = \frac{3^x}{x^2}$
$y' = \frac{(x^2)(3^x \ln 3) - (2x 3^x)}{(x^2)^2}$
$y' = \frac{x 3^x \ln 3 - 2\cdot 3^x}{x^3}$
$y' = \frac{3^x(x\ln 3 - 2)}{x^3}$

h) $y = (2^x)(3^{x^2})$
$y' = 2^x \ln 2\, 3^{x^2} + 2^x 3^{x^2} \ln 3 \cdot 2x$
$y' = 3^{x^2}\cdot 2^x [\ln 2 + 2x \ln 3]$

6. $y = e^{8x}$
$y' = e^{8x}\cdot 8$
$y' = 8e^{8x}$

7. $y = e^{-4x}$
$y' = e^{-4x}\cdot(-4)$
$y' = -4e^{-4x}$

8. $y = 3e^{5x}$
$y' = 3e^{5x}(5)$
$y' = 15e^{5x}$

9. $y = -2e^{-4x}$
$y' = -2e^{-4x}(-4)$
$y' = 8e^{-4x}$

10. $y = 6e^{2-x^2}$
$y' = 6e^{2-x^2}(-2x)$
$y' = -12xe^{2-x^2}$

11. $y = e^{x^2-5x+6}$
$y' = e^{x^2-5x+6}(2x-5)$
$y' = (2x-5)e^{x^2-5x+6}$

12. $y = e^{-2x^3}$
$y' = e^{-2x^3}(-6x^2)$
$y' = -6x^2 e^{-2x^3}$

13. $y = 10e^{4x-2x^2}$
$y' = 10e^{4x-2x^2}(4-4x)$
$y' = 40(1-x)e^{4x-2x^2}$

14. $y = e^{(x-4)^3}$
$y = e^{(x-4)^3}\cdot 3(x-4)$
$y = 3(x-4)^2 e^{(x-4)^3}$

7.2

15. $y = -5e^{-(3x+1)^2}$

$y = -5e^{-(3x+1)^2} \cdot -2(3x+1) \cdot 3$

$y = 30(3x+1)e^{-(3x+1)^2}$

16. $y = e^{2/x}$

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

$y' = \frac{-2}{x^2} e^{2/x}$

17. $y = 11e^{-4/x^2}$

$y' = 11e^{-4/x^2} \cdot (8)(x^{-3})$

$y' = \frac{88}{x^3} e^{-4/x^2}$

18. $y = e^{4/x+3}$

$y' = e^{(4/x+3)} \cdot \left(\frac{(x+3)(0) - (4)(1)}{(x+3)^2} \right)$

$y = \frac{-4e^{(4/x+3)}}{(x+3)^2}$

19. $y = 9e^{-2/(x^3+4)}$

$y' = 9e^{-2/x^3+4} \cdot \frac{(0) - (-2)(3x^2)}{(x^3+4)^2}$

$y' = \frac{54x^2 e^{-2/x^3+4}}{(x^3+4)^2}$

20. $y = e^{\ln 7x}$) property # 4.

$y = 7x$

$y' = 7$

21. $y = e^{\ln(2x^3 - x^2)}$

$y = 2x^3 - x^2$

$y' = 6x^2 - 2x$

$y' = 2x(3x-1)$

22. $y = e^{4\ln x}$

$y = e^{\ln x^4}$

$y = x^4$

$y' = 4x^3$

23. $y = e^{-3\ln(2x-1)}$

$y = e^{\ln(2x-1)^{-3}}$

$y = (2x-1)^{-3}$

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

$y' = -6(2x-1)^{-4}$

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

24. $y = xe^x$

$y = (1)e^x + (x)(e^x)$

$y = (1+x)e^x$

25. $y = 2x^2 e^x$

$y' = 4x e^x + 2x^2 e^x$

$y' = 2xe^x(2+x)$

$y' = 2x(2+x)e^x$

26. $y = (x+2)e^{2x}$

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

$y' = (1 + 2x + 4)e^{2x}$

$y' = (2x+5)e^{2x}$

27. $y = (x+2)e^{(x+2)^2}$

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

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

$y' = (1 + 2x^2 + 8x + 8)e^{(x+2)^2}$

$y' = (2x^2 + 8x + 9)e^{(x+2)^2}$

7.2

28 $y = (2x^3+3)e^{2x^3+3}$

$y' = (6x^2)(e^{2x^3+3}) + (2x^3+3)(e^{2x^3+3})(6x^2)$

$y' = (6x^2 + 12x^5 + 18x^2)e^{2x^3+3}$

$y' = (12x^5 + 24x^2)e^{2x^3+3}$

$y' = 12x^2(x^3+2)e^{2x^3+3}$

29. $y = \frac{x}{e^x}$

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

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

30. $y = \frac{e^{2x}}{2x^3}$

$y' = \frac{2x^3 e^{2x}(2) - e^{2x}(6x^2)}{(2x^3)^2}$

$y' = \frac{4x^3e^{2x} - 6x^2e^{2x}}{4x^6}$

$y' = \frac{2xe^{2x} - 3e^{2x}}{2x^4}$

$y' = \frac{(2x-3)e^{2x}}{2x^4}$

31. $y = \frac{e^{4x+3}}{4x+3}$

$y' = \frac{(4x+3)e^{4x+3}(4) - (4)e^{4x+3}}{(4x+3)^2}$

$y' = \frac{(16x+12-4)e^{4x+3}}{(4x+3)^2}$

$y' = \frac{(16x+8)e^{4x+3}}{(4x+3)^2}$

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

32. $y = 6e^{\sqrt{x}}$

$y' = 6e^{\sqrt{x}}(\frac{1}{2})x^{-1/2}$

$y' = \frac{3e^{\sqrt{x}}}{\sqrt{x}}$

33 $y = -4e^{\sqrt[4]{x^3}}$

$y = -4e^{\sqrt[4]{x^3}} \cdot (\frac{3}{4})x^{-1/4}$

$y = \frac{-3e^{\sqrt[4]{x^3}}}{\sqrt[4]{x}}$

34. $y = \pi x e^{\pi x}$

$y' = \pi e^{\pi x} + \pi x e^{\pi x}(\pi)$

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

7.2

35. $y = \frac{1}{3} \cdot x^3 e^{\ln 6x}$

$y = \frac{1}{3} x^3 6x$

$y = 2x^4$

$y' = 8x^3$

36. $y = \sqrt{x}\, e^{(\ln x)/2}$

$y = x^{1/2} / e^{\frac{1}{2}\ln x}$

$y = x^{1/2} e^{\ln x^{1/2}}$ $\qquad e^{\log_e x^{1/2}}$

$y = x^{1/2} x^{1/2}$

$y = x$

$y' = 1$

37. $y = \dfrac{e^{3x-1}}{2x+1}$

$y' = \dfrac{(2x+1)(e^{3x-1}\cdot 3) - (e^{3x-1})(2)}{(2x+1)^2}$

$y' = \dfrac{(6x+1)(e^{3x-1})}{(2x+1)^2}$

38. $y = e^{15}$

$y' = 0$

39. $y = e^3 x^3$

$y' = 3e^3 x^2$

40. $y = e^{2x} e^{3x}$

$y = e^{5x}$

$y' = e^{5x}(5)$

$y' = 5e^{5x}$

41. $y = (e^{6x-5})^{10}$

$y = e^{60x-50}$

$y' = 60e^{10(6x-}$

42. $y = \ln(e^{3x}+2)$

$y' = \dfrac{1}{e^{3x}+2} 3e^{3x}$

$y' = \dfrac{3e^{3x}}{e^{3x}+2}$

43. $y = e^x \ln x$

$y' = e^x \ln x + e^x \left(\frac{1}{x}\right)(1)$

$y' = \dfrac{x e^x \ln x + e^x}{x}$

$y' = \dfrac{e^x(x\ln x + 1)}{x}$

44. $y = \ln\left(\dfrac{e^x+1}{e^x-1}\right)$

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

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

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

45. $y = x\ln(xe^x)$

$y' = (1)\ln(xe^x) + x\left(\frac{1}{xe^x}\right)(e^x + xe^x)$

$y' = \ln(xe^x) + 1 + x$

$y' = \ln x + \ln e^x + 1 + x$

$y' = \ln x + x + 1 + x$

$y' = \ln x + 2x + 1$