5.4 p. 347 (9, 15, 37, 39-59 EOO, 61, , 87-103 EOO, 117)

9. $9 - 2e^x = 7$

$-2e^x = -2$

$e^x = 1$

$\ln e^x = \ln(1)$

$x = \ln 1 = 0$

$\boxed{x = 0}$

15. $\ln(x-3) = 2$

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

$x - 3 = e^2$

$x = \boxed{e^2 + 3 \approx 10.389}$

37. a. $y = e^{3x}$

$y' = e^{3x} \cdot 3$

$y' = 3e^{3x}$

$(0,1)\ y' = 3e^{3\cdot 0} = 3e^0 = \boxed{3}$

b. $y = e^{-3x}$

$y' = e^{-3x} \cdot -3$

$y' = -3e^{-3x}$

$(0,1)\ y' = -3e^{-3(0)} = \boxed{-3}$

39. $f(x) = e^{2x}$

$\boxed{f'(x) = 2e^{2x}}$

43. $y = e^{\sqrt{x}}$

$y' = e^{\sqrt{x}} \cdot \frac{1}{2}x^{-\frac{1}{2}}$

$\boxed{y' = \frac{e^{\sqrt{x}}}{2\sqrt{x}}}$

47. $y = \ln(e^{x^2})$ or $y = x^2$

$y' = \frac{1}{e^{x^2}} \cdot e^{x^2} \cdot 2x$ $y' = 2x$

$\boxed{y' = 2x}$

51. $y = \frac{2}{e^x + e^{-x}} = 2(e^x + e^{-x})^{-1}$

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

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

55. $f(x) = e^{-x}\ln x$

$f'(x) = e^{-x} \cdot \frac{1}{x} + \ln x \cdot -e^{-x}$

$f'(x) = \frac{1}{xe^x} - \frac{\ln x}{e^x} = \boxed{\frac{1}{e^x}\left(\frac{1}{x} - \ln x\right)}$

59. $xe^y - 10x + 3y = 0$

$xe^y\, dy/dx + e^y - 10 + 3\frac{dy}{dx} = 0$

$xe^y \frac{dy}{dx} + 3\frac{dy}{dx} = 10 - e^y$

$\frac{dy}{dx}(xe^y + 3) = 10 - e^y$

$\boxed{\frac{dy}{dx} = \frac{10 - e^y}{xe^y + 3}}$

61. $f(x) = (3+2x)e^{-3x}$

$f'(x) = (3+2x)(-3e^{-3x}) + e^{-3x}(2)$

$f'(x) = -9e^{-3x} - 6xe^{-3x} + 2e^{-3x} = -e^{-3x}(7 + 6x)$

$f''(x) = -e^{-3x}(6) + (7+6x)\cdot 3e^{-3x}$

$f''(x) = -6e^{-3x} + 21e^{-3x} + 18xe^{-3x}$

$f''(x) = e^{-3x}(-6 + 21 + 18x) = e^{-3x}(18x + 15)$

$\boxed{f''(x) = 3e^{-3x}(6x + 5)}$

87. $\int e^{5x}(5)\,dx$ $u=5x$

$du=5dx$

$\int e^u du = e^u + C$

$\boxed{e^{5x}+C}$

91. $\int x e^{-x^2}\,dx$ $u=-x^2$

$du=-2x\,dx$

$-\frac{1}{2}\int -2x e^{-x^2}\,dx$

$-\frac{1}{2}\int e^u du$

$-\frac{1}{2}e^u + C$

$\boxed{-\frac{1}{2}e^{-x^2}+C}$

95. $\int \frac{e^{-x}}{1+e^{-x}}\,dx$ $u=1+e^{-x}$

$du=-e^{-x}dx$

$-\int \frac{-e^{-x}}{1+e^{-x}}\,dx$

$-\int \frac{1}{u}\,du = \boxed{-\ln|1+e^{-x}|+C}$

99. $\int e^x\sqrt{1-e^x}\,dx$ $u=1-e^x$

$du=-e^x dx$

$-\int -e^x\sqrt{1-e^x}\,dx$

$-\int u^{1/2}\,du$

$-\frac{2}{3}u^{3/2}+C$

$\boxed{-\frac{2}{3}(1-e^x)^{3/2}+C}$

103. $\int \frac{5-e^x}{e^{2x}}\,dx = \int \frac{5}{e^{2x}} - \frac{e^x}{e^{2x}}\,dx$

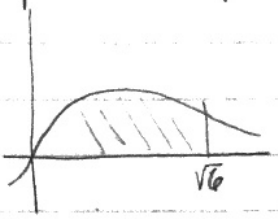
$\int (5e^{-2x}-e^{-x})\,dx$

$5\int e^{-2x}dx + \int -e^{-x}dx$ $u=-2x$, $du=-2dx$

$-\frac{5}{2}\int -2e^{-2x}dx + \int -e^{-x}dx$

$\boxed{-\frac{5}{2}e^{-2x}+e^{-x}+C}$

117. $y = xe^{-x^2/4}$ $y=0$ $x=0$ $x=\sqrt{6}$



$\int_0^{\sqrt{6}} xe^{-x^2/4}\,dx$ $u=\frac{-x^2}{4}$ $du=\frac{-2x}{4}dx=\frac{-1}{2}x\,dx$

$-2\int_0^{\sqrt{6}} -\frac{1}{2}xe^{-x^2/4}\,dx$ $x=0,\ u=0$

$x=\sqrt{6},\ u=\frac{-(\sqrt{6})^2}{4}=-1.5$

$-2\int_0^{-1.5} e^u du$

$-2\left[e^u\right]_0^{-1.5} = -2\left[e^{-1.5}-e^0\right]$

$\frac{-2}{e^{3/2}} - -2$

$\boxed{\frac{-2}{e^{3/2}}+2 \approx 1.554}$