DiffEq - Ch 7 - Required Practice **ANSWERS ONLY**

7.1

#1. $\frac{2}{s}e^{-s}-\frac{1}{s}$

#2. $-\frac{1}{s}e^{-s}+\frac{1}{s^2}$

#3. $\frac{e^7}{s-1}$

#4. $\frac{1}{(s-4)^2}$

#5. $\frac{48}{s^5}$

#6. $2\frac{1}{s^3}+6\frac{1}{s^2}-3\frac{1}{s}$

#7. $\frac{1}{s}+\frac{1}{s-4}$

#8. $\frac{1}{s}+2\frac{1}{s-2}+\frac{1}{s-4}$

#9. $4\frac{2}{s^3}-5\frac{3}{s^2+9}$

7.2 day 1

#1. $\frac{1}{2}t^2$

#2. $t-2t^4$

#3. $1+3t+\frac{3}{2}t^2+\frac{1}{6}t^3$

#4. $t-1+e^{2t}$

#5. $\frac{1}{4}e^{\left(-\frac{1}{4}t\right)}$

#6. $\frac{5}{7}\sin(7t)$

#7. $\cos\left(\frac{1}{2}t\right)$

#8. $2\cos(3t)-2\sin(3t)$

#9. $\frac{1}{3}-\frac{1}{3}e^{-3t}$

#10. $\frac{3}{4}e^{-3t}+\frac{1}{4}e^{t}$

#11. $0.3e^{0.1t}+0.6e^{-0.2t}$

#12. $\frac{1}{2}e^{2t}-e^{3t}+\frac{1}{2}e^{6t}$

#13. $\frac{1}{5}-\frac{1}{5}\cos\left(\sqrt{5}t\right)$

#14. $-4+3e^{-t}+\cos t+3\sin t$

#15. $\frac{1}{3}\sin t-\frac{1}{6}\sin(2t)$

7.2 day 2

#1. $y(t) = -1 + e^{t}$

#2. $y(t) = \frac{19}{10}e^{-6t} + \frac{1}{10}e^{4t}$

#3. $y(t) = \frac{1}{13}e^{t} - \frac{1}{13}\cos(5t) + \frac{5}{13}\sin(5t)$

#4. $y(t) = \frac{4}{3}e^{-t} - \frac{1}{3}e^{-4t}$

#5. $y(t) = 10\cos t + 2\sin t - \sqrt{2}\sin\left(\sqrt{2}t\right)$

#6. $y(t) = \frac{1}{2}e^{-t} + \frac{5}{18}e^{t} - \frac{8}{9}e^{\left(-\frac{1}{2}t\right)} + \frac{1}{9}e^{-2t}$

7.3 day 1

#1. $\frac{1}{(s-10)^2}$

#2. $\frac{3!}{(s+2)^4}$

#3. $\frac{1}{(s-2)^2} + 2\frac{1}{(s-3)^2} + \frac{1}{(s-4)^2}$

#4. $\frac{3}{(s-1)^2 + 9}$

#5. $\frac{s}{s^2 + 25} - \frac{(s-1)}{(s-1)^2 + 25} + 3\frac{(s+4)}{(s+4)^2 + 25}$

#6. $\frac{1}{2}e^{-2t}t^2$

#7. $e^{3t}\sin t$

#8. $e^{-2t}\cos t - 2e^{-2t}\sin t$

#9. $e^{-t} - te^{-t}$

#10. $y(t) = 2e^{-4t} + te^{-4t}$

#11. $y(t) = e^{-t} + 2te^{-t}$

#12. $y(t) = \frac{10}{9}te^{3t} + \frac{2}{27} + \frac{1}{9}t - \frac{2}{27}e^{3t}$

7.3 day 2

#1. $f(t)\,u(t-a)$

#2. $f(t)\,u(t-a)-f(t)\,u(t-b)$

#3. $f(t-a)\,u(t-a)-f(t-a)\,u(t-b)$

#4. $f(t-b)\,u(t-b)$

#5. $f(t)-f(t)\,u(t-a)$

#6. $f(t)-f(t)\,u(t-b)$

7.3 day 3

#1. $e^{-s}\dfrac{1}{s^2}$

#2. $e^{-2s}\dfrac{1}{s^2}+2e^{-2s}\dfrac{1}{s}$

#3. $e^{-\pi s}\dfrac{s}{s^2+4}$

#4. $\dfrac{1}{2}(t-2)^2\,u(t-2)$

#5. $\sin(t-\pi)\,u(t-\pi)$ *or* $-\sin t\,u(t-\pi)$

#6. $u(t-1)-e^{-(t-1)}u(t-1)$

#7. $f(t)=2-4u(t-3)$

$2\dfrac{1}{s}-4e^{-3s}\dfrac{1}{s}$

#8. $f(t)=t^2u(t-1)$

$e^{-s}\dfrac{2}{s^3}+2e^{-s}\dfrac{1}{s^2}+e^{-s}\dfrac{1}{s}$

#9. $f(t)=t-t\,u(t-2)$

$\dfrac{1}{s^2}-e^{-2s}\dfrac{1}{s^2}-2e^{-2s}\dfrac{1}{s}$

#10. $y(t)=5u(t-1)-5e^{-(t-1)}u(t-1)$

#11.

$$y(t)=-\frac{1}{4}+\frac{1}{2}t+\frac{1}{4}e^{-2t}-\frac{1}{4}u(t-1)-\frac{1}{2}(t-1)u(t-1)+\frac{1}{4}e^{-2(t-1)}u(t-1)$$

#12.

$$y(t)=\cos(2t)+\frac{1}{3}\sin t\,u(t-2\pi)-\frac{1}{6}\sin(4t)\,u(t-2\pi)$$

#13.

$$y(t)=\sin t+u(t-\pi)+\cos t\,u(t-\pi)-u(t-2\pi)+\cos t\,u(t-2\pi)$$

7.4

#1. $\dfrac{1}{(s+10)^2}$

#2. $\dfrac{s^2-4}{(s^2+4)^2}$

#3. $\dfrac{12(s-2)}{\left[(s-2)^2+36\right]^2}$

#4. $y(t)=-\dfrac{1}{2}e^{-t}+\dfrac{1}{2}\cos t+\dfrac{1}{2}t\sin t-\dfrac{1}{2}t\cos t$

#5. $y(t)=\cos(3t)+\dfrac{5}{3}\sin(3t)+\dfrac{1}{6}t\sin(3t)$

#6.

$$y(t)=\frac{1}{4}\sin(4t)+\frac{1}{8}t\sin(4t)-\frac{1}{8}(t-\pi)\sin\big(4(t-\pi)\big)u(t-\pi)$$

7.5

#1. $y(t) = e^{3(t-2)}u(t-2)$

#2. $y(t) = \sin t + \sin t\, u(t-2\pi)$

#3.

$$y(t) = \sin\left(t-\frac{\pi}{2}\right)u\left(t-\frac{\pi}{2}\right) + \sin\left(t-\frac{3\pi}{2}\right)u\left(t-\frac{3\pi}{2}\right)$$

#4. $y(t) = \frac{1}{2} - \frac{1}{2}e^{-2t} + \frac{1}{2}u(t-1) - \frac{1}{2}e^{-2(t-1)}u(t-1)$

Ch7 Test Review

#1. $\frac{48}{s^5}$

#2. $2\frac{1}{s^3}+6\frac{1}{s^2}-3\frac{1}{s}$

#3. $2\frac{1}{s^3}-\frac{1}{s+9}+5\frac{1}{s}$

#4. $\frac{1}{2}e^{2t}-e^{3t}+\frac{1}{2}e^{6t}$

#5. $\frac{1}{2}-e^{t}-\frac{1}{3}e^{-t}+\frac{5}{6}e^{2t}$

#6. $y(t)=\frac{19}{10}e^{-6t}+\frac{1}{10}e^{4t}$

#7. $y(t)=\frac{11}{10}e^{4t}+\frac{5}{2}-2e^{3t}-\frac{3}{5}e^{-t}$

#8. $e^{3t}\sin t$

#9. $\frac{1}{2}e^{-t}\sin(2t)$

#10. $e^{-2t}\cos t-2e^{-2t}\sin t$

#11. $2e^{-3t}\cos(5t)-\frac{1}{5}e^{-3t}\sin(5t)$

#12. $y(t)=\frac{10}{9}te^{3t}+\frac{2}{27}+\frac{1}{9}t-\frac{2}{27}e^{3t}$

#13. $\frac{1}{2}(t-2)^2\,u(t-2)$

#14. $\sin(t-\pi)\,u(t-\pi)$ *or* $-\sin t\,u(t-\pi)$

#15. $f(t)=2-4u(t-3)$
$2\frac{1}{s}-4e^{-3s}\frac{1}{s}$

#16. $f(t)=t-t\,u(t-2)$
$\frac{1}{s^2}-e^{-2s}\frac{1}{s^2}-2e^{-2s}\frac{1}{s}$

#17. $\frac{1}{(s+10)^2}$

#18. $\frac{12(s-2)}{\left[(s-2)^2+36\right]^2}$

#19. $\frac{(s-3)^2+9}{\left[(s-3)^2+9\right]^2}$

#20. $y(t)=5te^{t}+\frac{1}{2}t^2e^{t}$