Homework 6

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1. (a) Per the rules of Laplace Transforms, we can convolve two signals by the rule that:

$$y(t) = x_1(t) * x_2(t) \rightarrow Y(s) = X_1(s)X_2(s)$$

As such, we may obtain:

$$X_1(s) = \frac{1}{s+4} \quad \text{and} \quad X_2(s) = \frac{1}{s+2}$$

Now, we account for the shifts. We know that, for $x(t) \rightarrow x(t-t_o)$ the transform becomes $X(s) \rightarrow e^{st_o}X(s)$. Furthermore, we know that for $x(-t) \rightarrow X(-s)$. Thus, we find:

$$X_1(s) = \frac{e^{-3s}}{-s+4} \quad \text{and} \quad X_2(s) = \frac{e^{-2s}}{s+2}$$

Multiplying together, we find:

$$\boxed{Y(s) = \frac{e^{-5s}}{(4-s)(s+2)}, \quad \text{ROC: } -2 < \sigma < 4}$$

(b)

2.

3. (a)
(b)
(c)
(d)

4. (a)
(b) i.
ii.

iii.

5.

6.

7. (a)
   (b)

8. (a)
   (b)
   (c)
   (d)
   (e)
   (f)
   (g)

9. (a)
   (b)
   (c)
   (d)