Homework 4

1a. $(10s-60)Y = X(.5s^3 + 18s^2 + 87.5s + 70)$

$$Y = \frac{s^3X + 18s^2X + 87.5sX + 70X - 10sY}{60}$$

$$\Rightarrow y = \frac{1}{60}x''' + \frac{18}{60}x'' + \frac{87}{60}x' + \frac{7}{6}x - 10y'$$

1b $x(t) = 2 + 3\cos(4t) = 2 + ae^{st}$ $\quad s = \{\pm j4, 0\}$

$y(t) \Rightarrow$ $0.1907 - 0.0649j$ $\quad 0.1907 + 0.0649j$ $\quad -0.8571$

$.2014 \angle -18.79°$ $\quad .2014 \angle 18.79°$ $\quad 0.8571 \angle 0$

$y(t) = 0.8571 + .2014\cos(4t - 18.79°)$

1c $\frac{x}{10(s+6)} =$

2. $g = \frac{50}{(s-1+3j)(s-1-3j)(s+30)} = \frac{50}{s^3 + 32s^2 + 70s + 300}$

a. $y = \frac{1}{50}x''' + \frac{32}{50}x'' + \frac{70}{50}x' + \frac{300}{50}x$

b. $-0.1157 + 0.1179j$

$y(t) = 0.1652\cos(4t - 134.5°) + 0.1667$

c. $50 = A(s-1-3j)(s+30) + B(s-1+3j)(s+30) + C(s-1+3j)(s-1-3j)$

if $s = 1-3j$, $A = -\frac{5}{194} + \frac{155}{582}j$ $\quad B = \frac{5}{194} - \frac{155}{582}j$

$C = \frac{1}{17} \Rightarrow \frac{.2671 \angle 95.11}{(s-1+3j)} + \frac{.2671 \angle -95.11}{(s-1-3j)} + \frac{0.588}{(s+30)}$

$g(t) = [.5342e^{t}\cos(3t - 95.11) + 0.588e^{-30t}]u(t-2)$