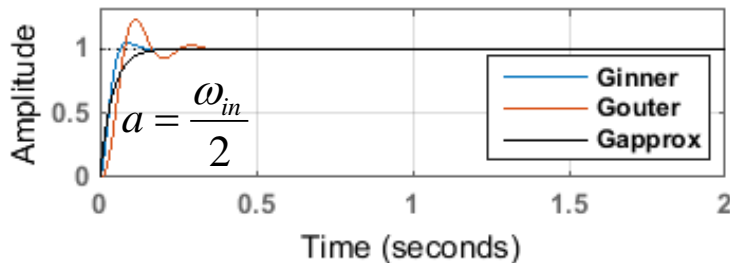
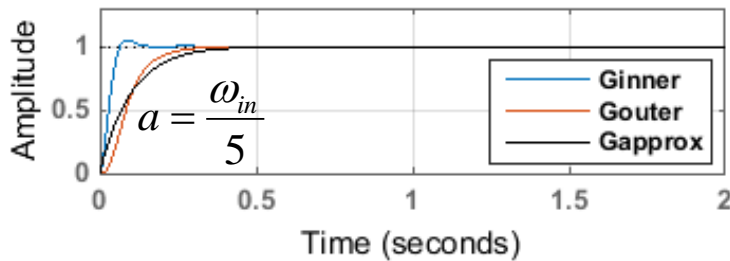
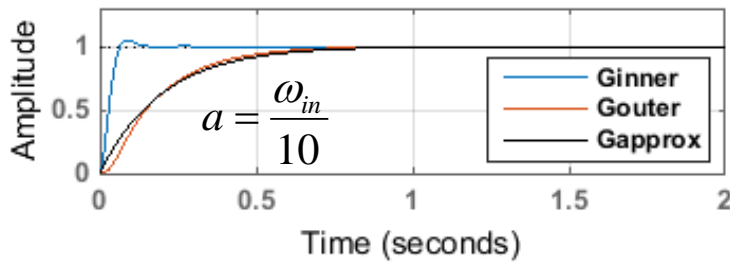
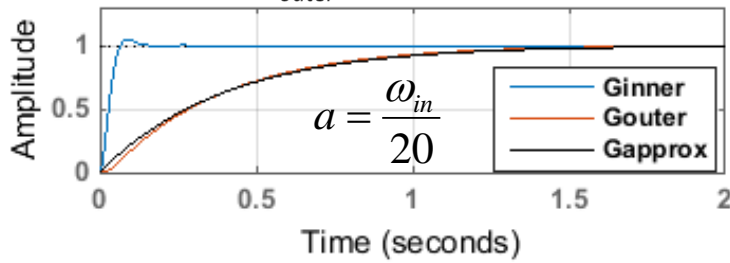
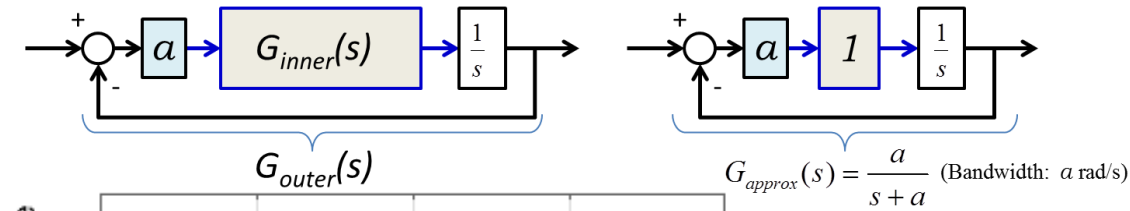


Homework 6 Review

1)



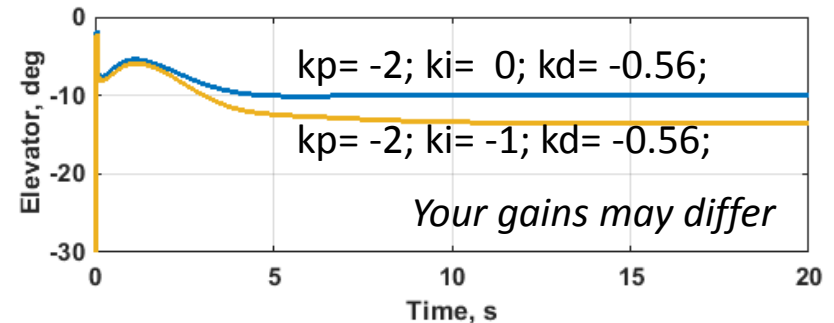
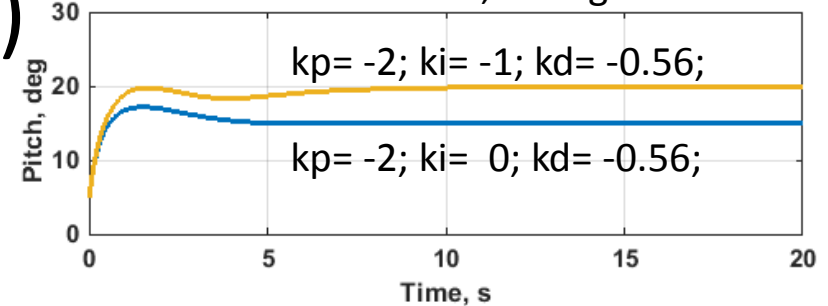
$$G_{outer}(s) = \frac{a\omega_{in}^2}{s^3 + 2\zeta\omega_{in}s^2 + \omega_{in}^2s + a\omega_{in}^2}$$

$$= \frac{a}{s \left[\frac{1}{\omega_{in}^2}s^2 + \frac{2\zeta}{\omega_{in}}s + 1 \right] + a}$$

6) $H_{\phi/\phi^c}(s) = \frac{k_{p\phi} a_{\phi_2}}{s^2 + (a_{\phi_1} + a_{\phi_2} k_{d\phi})s + k_{p\phi} a_{\phi_2}}$

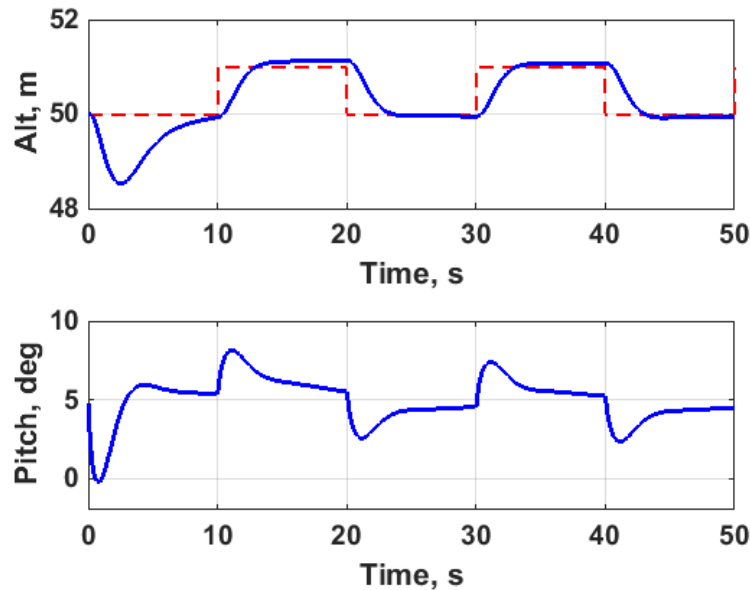
7) $H_{\chi/\chi^c} = \frac{k_{p,\chi} \mathbf{g}/V_g s + k_{i,\chi} \mathbf{g}/V_g}{s^2 + k_{p,\chi} \mathbf{g}/V_g s + k_{i,\chi} \mathbf{g}/V_g}$

2) UAVSIM Pitch Controller, 20deg command



Homework 6 Review

3) UAVSIM Altitude Controller



Example Gains:

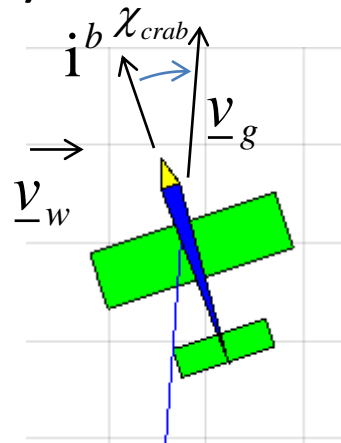
Pitch Controller:

$k_p = -2$;
 $k_i = 0$;
 $k_d = -0.56$;

Altitude Controller:

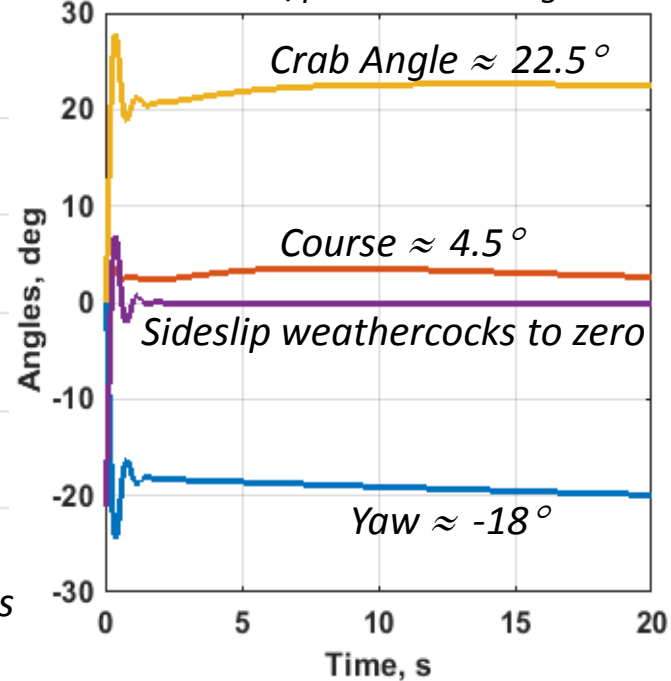
$k_p = 0.05$;
 $k_i = 0.02$;
 $k_d = 0$;

4) 5 m/s east wind

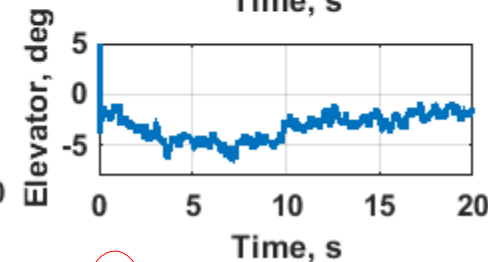
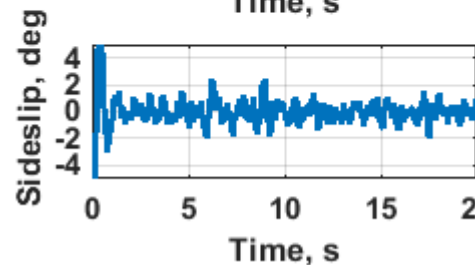
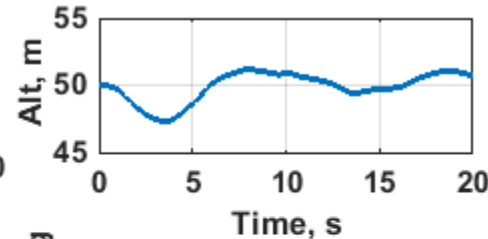
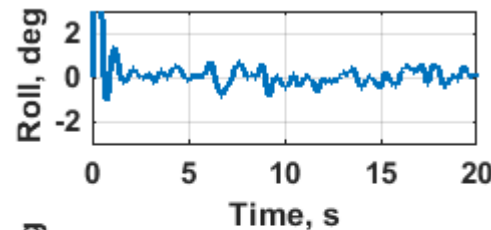
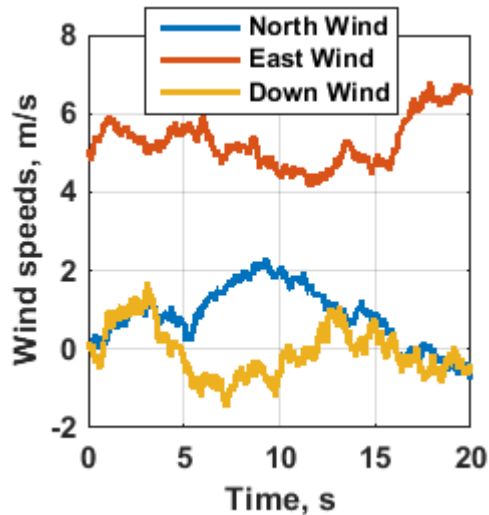


UAV is pushed by the wind, and crabs into the wind

Your results may differ somewhat due to alt/pitch controller gains



5)



$$\text{wind_ned} = \text{ws_ned} + \text{R_ned2b}' * \text{gust_b};$$