13.9–23. A block of speech data has autocorrelation terms as in Eq. (13.5–14) given by $R(0) = 1.0$, $R(1) = 0.866$, $R(2) = 0.554$, and $R(3) = 0.225$. Find the predictor coefficients $\{a_i,\ i = 1,\ 2,\ 3\}$.

13.9–24. Given the set of predictor coefficients $a_1 = 1.295$, $a_2 = -0.535$, $a_3 = 0.171$, and $a_4 = -0.233$, assume that $R(0) = 1$.

(a) Find the PARCOR coefficients $\{p_i,\ i = 1,\ 2,\ 3,\ 4\}$;

(b) Calculate the mean squared prediction error for the first through fourth order systems;

(c) Is the fourth order system (synthesizer) stable?

13.9–25. The following PARCOR coefficients are computed from a frame of speech data: $p_1 = -0.9454$, $p_2 = 0.92386$, $p_3 = -0.56198$, $p_4 = -0.09454$, $p_5 = 0.20218$, $p_6 = 0.53595$, $p_7 = -0.32922$, $p_8 = -0.05899$.

(a) Do these coefficients represent a stable system?

(b) What is the mean squared prediction error for this 8th order system?

(c) Find the corresponding predictor coefficients for a 4th order predictor.

13.9–26. An LPC system has the predictor coefficients $a_1 = 1.793$, $a_2 = -1.401$, $a_3 = 0.566$, and $a_4 = -0.147$. Let the receiver gain $G = 2$, the pitch period length $P = 60$, and assume that the speech is voiced. For zero initial conditions at the beginning of the pitch period, synthesize the first 10 samples.