A. Consider the sequence 1, 2, 8, 40, 224, 1344, 8448, 54912, \ldots defined by the initial condition \( a_1 = 1 \) and the recurrence relation \( a_n = 2(a_1a_{n-1} + a_2a_{n-2} + \ldots + a_{n-1}a_1) \) (valid for all \( n \geq 2 \)). Find (and prove) a general formula for \( a_n \).

B. Chapter 7, problem 22. (Hint: Label the points 1 through 2\( n \). Let \( h_{n,k} \) be the number of ways to join the points in pairs so that the resulting line segments do not intersect, where point 1 is joined to point \( k \). Show that \( h_{n,k} = 0 \) when \( k \) is odd, and find a formula for \( h_{n,k} \) in terms of \( h_1, h_2, \ldots, h_{n-1} \) when \( k \) is even. Use this to write \( h_n \) as a sum of products of earlier terms of the sequence.) You may find it convenient to define \( h_0 = 1 \).

C. Chapter 7, problem 41.

D. Chapter 7, problem 42(c).

E. Chapter 7, problem 44.

F. Chapter 7, problem 46.