I. Problem (Jones) à la S.5.35
Construct a poly of deg. 4 w/ zeros ±2 and 1-3i, with real coefficients.

S ol. i. Observe: The "missing zero" is 1+3i.

A. \[ P(x) = (x-2)(x+2)(x-(1-3i))(x-(1+3i)) \]
\[ = (x^2-4)[(x+3i)(x-3i)] \]
\[ = (x^2-4)[x^2-(3i)^2] = x^4-2x^3+6x^2-8x+40 \]

B. \[ R(x) = \frac{x^2+5x+6}{x^2-1}, \] set \[ x^2-1 = 0 \implies x^2 = 1, \ x = \pm 1 \]
\[ \text{Dom} R = (-\infty, -1) \cup (-1, 1) \cup (1, \infty) \]

II. 5.3.6 Rational Functions (p. 299).
Rational functions expand our repertoire of models.

A. A rational function is of the form
\[ R(x) = \frac{P(x)}{Q(x)} \] where \( P(x) \) and \( Q(x) \) are polynomials.
Thus \( R_1(x) = x + 3 \) on \((-\infty, -2) U (-2, \infty)\).

So the graph of \( R_1 \) looks like the graph of the line \( y = x + 3 \) except \( R_1(x) \) has a "hole" in it at \( x = -2 \) and \( y = x + 3 \) does not!

Here are TI-84 graphs of

\[
R_1(x) = \frac{x^2 + 5x + 6}{x^2 - 1}
\]

\[
R_1(x) = \frac{x^2 + 5x + 6}{x + 2}
\]