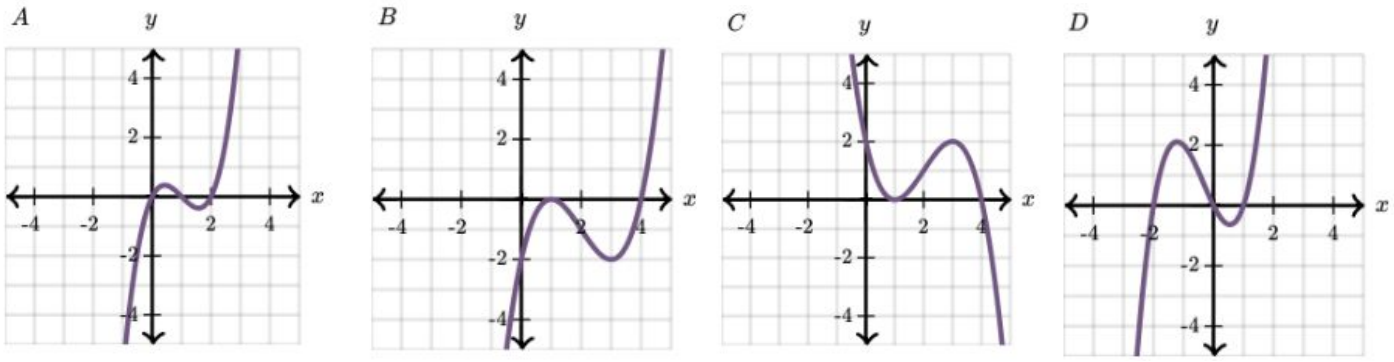
Challenge Problems

1. Find a function $f(x)$ that meets the following criteria:
   - $f(3) = 0$
   - f has a horizontal asymptote at $y = 2$
   - f has a vertical asymptote at $x = 4$ and $x = -4$
   - $f(0) = 1$ (Meeting this requirement is the trickiest part!)

2. Factor the polynomial $h(x) = x^5 + 9x^3 - 8x^2 - 72$ into linear and irreducible quadratic factors with real coefficients. Then factor $h(x)$ into linear factors with complex coefficients.
   a. Linear and Irreducible quadratic factors of $h(x)$ with real coefficients:

   b. Linear factors of $h(x)$ with complex coefficients:

3. Which of the following could be the graph of $y = ax^3 + bc^2 + cx + 2$, where a, b, and c are real numbers? (Could be more than one of the graphs below)



4. Which of the following could be the graph of $y = k(x-2)^m(x+1)^n$, where k is a real number, m is an even integer, and n is an odd integer? (Could be more than one of the graphs below)