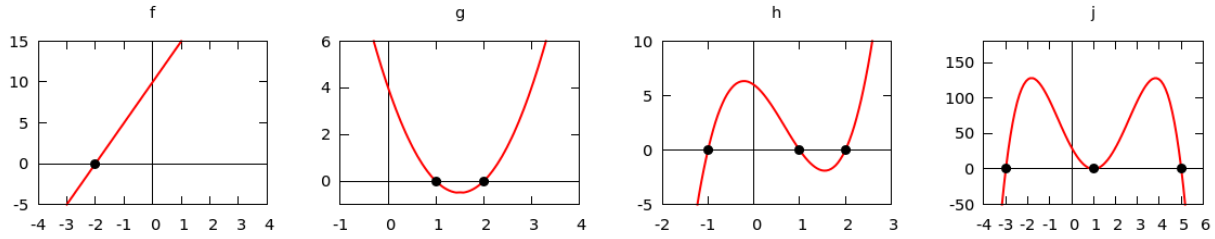
3.3 Polynomial Functions

Supplementary Notes

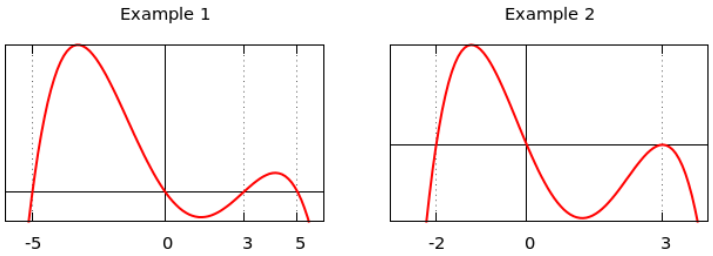
$$\begin{aligned} f(x) &= a_n x^n + a_{n-1}x^{n-1} + \cdots + a_1 x + a_0 && \} \text{ expanded form} \\ &= a(x - z_1)(x - z_2)\cdots(x - z_{n-1})(x - z_n) && \} \text{ factored form} \quad (a_n, a \neq 0) \end{aligned}$$

Below are the graphs of

$$\begin{aligned} f(x) &= 5x + 10 && = 5(x + 2) \\ g(x) &= 2x^2 - 6x + 4 && = 2(x - 1)(x - 2) \\ h(x) &= 3x^3 - 6x^2 - 3x + 6 && = 3(x + 1)(x - 1)(x - 2) \\ j(x) &= -2x^4 + 8x^3 + 20x^2 - 56x + 30 && = -2(x + 3)(x - 1)^2(x - 5) \end{aligned}$$



Example 1 & 2: Write fourth degree polynomial equations in lowercase x, y that have the following graphs



Excercises

1. Determine the real zeros of $f(x) = (x + 1)^2(x^2 - 4)(x^2 + 4)$.
2. Select the equation that has zeros at -4, 2, and 5.

   A. $y = (x - 4)(x + 2)^4(x + 5)$
   B. $y = -2(x + 4)(x - 2)(x - 5)$
   C. $y = (x - 4)^2(x - 2)(x - 5)$
   D. $y = (x + 4)(x + 2)(x + 5)$

E. $y = (x^2 + 4)(x - 2)(x - 5)$

3. Write the third degree polynomial equation in lowercase x, y that has zeros $-6, 1$, and 2 and y-intercept 24.