

### Solving Higher Order Polynomials SP

Solve for the solutions the polynomial

1.  $f(x) = 3x^4 - 27x^3 + 84x^2 - 144x + 120$

$$\begin{array}{r|rrrrr} 2 & 3 & -27 & 84 & -144 & 120 \\ & \downarrow & 6 & -42 & 84 & -120 \\ \hline 5 & 3 & -21 & 42 & -60 & 0 \\ & \downarrow & 15 & -30 & 60 & \\ \hline & 3 & -6 & 12 & 0 & \end{array}$$

$$3x^2 - 6x + 12$$

$$3(x^2 - 2x + 4)$$

$$(-2)^2 - 4(1)(4) = -12$$

$$\frac{2 \pm \sqrt{-12}}{2(1)} = \frac{2 \pm 2i\sqrt{3}}{2} = 1 \pm i\sqrt{3}$$

2.  $f(x) = x^4 - 10x^3 + 9x^2 + 58x - 16$

$$\begin{array}{r|rrrrr} -2 & 1 & -10 & 9 & 58 & -16 \\ & \downarrow & -2 & 24 & -66 & 16 \\ \hline 8 & 1 & -12 & 33 & -8 & 0 \\ & \downarrow & 8 & -32 & 8 & \\ \hline & 1 & -4 & 1 & 0 & \end{array}$$

$$x^2 - 4x + 1$$

3.  $y = x^4 + 2x^3 - 25x^2 - 26x + 120$

$$\begin{array}{r|rrrrr} -5 & 1 & 2 & -25 & -26 & 120 \\ & \downarrow & -5 & 15 & 50 & -120 \\ \hline -3 & 1 & -3 & -10 & 24 & 0 \\ & \downarrow & -3 & 18 & -24 & \\ \hline & 1 & -6 & 8 & 0 & \end{array}$$

$$x^2 - 6x + 8 \rightarrow (x-4)(x-2)$$

$$(x-2)(x-5)(3)(x^2-2x+4)$$

solutions: 2, 5,  $1 \pm i\sqrt{3}$

$$(x+2)(x-8)(x^2-4x+1)$$

solutions: -2, 8,  $2 \pm \sqrt{3}$

$$(-4)^2 - 4(1)(1) = 12$$

$$\frac{4 \pm \sqrt{12}}{2(1)} = \frac{4 \pm 2\sqrt{3}}{2} = 2 \pm \sqrt{3}$$

$$(x+5)(x+3)(x-4)(x-2)$$

solutions: -5, 3, 4, 2

4.  $f(x) = 2x^3 + 8x^2 + 11x + 15$

$$\begin{array}{r|rrrr} -3 & 2 & 8 & 11 & 15 \\ & \downarrow & -6 & -6 & -15 \\ \hline & 2 & 2 & 5 & \underline{0} \end{array}$$

$$2x^2 + 2x + 5$$

$$(2)^2 - 4(2)(5) = -36$$

$$\frac{-2 \pm \sqrt{-36}}{2(2)} = \frac{-2 \pm 6i}{4} = \frac{-1 \pm 3i}{2}$$

$$(x+3)(2x^2+2x+5)$$

solutions:  $\underline{-3, \frac{-1 \pm 3i}{2}}$

5. Write the polynomial function of least degree with integral coefficients that has the given zeros.

a)  $-2, 1, 3$

b)  $4i, 3, -3$

Degree:

Degree:

Function: