

1. Find the
remainder:
 $(x^3 - 2) \div (x + 1)$

$$f(-1) = (-1)^3 - 2$$
$$f(-1) = -1 - 2 = -3$$

remainder = -3

2. Find the possible rational zeros of:
 $f(x) = 2x^3 - x^2 - 7x + 6$

$$\frac{1, 2, 3, 6}{1, 2}$$

$$\pm(1, 1/2, 2, 3, 3/2, 6)$$

3. Given that $x = -2$ is one zero of the function, find the other zeros.

$$f(x) = x^3 - 4x^2 - 2x + 20$$

$$\begin{array}{r} \underline{-2} \mid 1 \quad -4 \quad -2 \quad 20 \end{array}$$

$$\begin{array}{r} -2 \quad 12 \quad -20 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \quad -6 \quad 10 \quad 0 \end{array}$$

$$x^2 - 6x + 10 = 0$$

$$\frac{6 \pm \sqrt{-4}}{2} = \frac{6 \pm 2i}{2} \quad \text{OR} \quad (x - 3)^2 = -10 + 9$$
$$(x - 3)^2 = -1$$

$$x = -2, 3 \pm i$$

4. Find all the zeros.

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

$$\begin{array}{r|rrrrr} -2 & 1 & 4 & 3 & -4 & -4 \end{array}$$

$$\begin{array}{r|rrrrr} & & -2 & -4 & 2 & 4 \end{array}$$

$$\begin{array}{r|rrrrr} & 1 & 2 & -1 & -2 & 0 \end{array}$$

$$x^3 + 2x^2 - x - 2 = 0$$

$$x^2(x + 2) - 1(x + 2) = 0$$

$$(x^2 - 1)(x + 2) = 0$$

$$x = -2, -1, 1$$

5. Find all the zeros.

$$f(x) = x^4 - 6x^3 + 12x^2 + 6x - 13$$

$$\begin{array}{r|rrrrr} 1 & 1 & -6 & 12 & 6 & -13 \\ & & 1 & -5 & 7 & 13 \\ \hline \end{array}$$

$$\begin{array}{r|rrrr|r} -1 & 1 & -5 & 7 & 13 & 0 \\ & & -1 & 6 & -13 & \\ \hline \end{array}$$

$$\begin{array}{r|rr|r} & 1 & -6 & 13 & 0 \\ \hline \end{array}$$

$$x^2 - 6x + 13 = 0$$

$$(x - 3)^2 = -13 + 9$$

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

OR

$$\frac{6 \pm \sqrt{-16}}{2} = \frac{6 \pm 4i}{2}$$

$$x = 1, -1, 3 \pm 2i$$

6. Write the cubic
polynomial function
with roots
 $5, -2 + i$

$$x=5 \quad x=-2+i \quad x=-2-i$$

$$f(x) = (x - 5)(x + 2 - i)(x + 2 + i)$$

$$f(x) = (x - 5)(x^2 + 4x + 5)$$

$$y = x^3 - x^2 - 15x - 25$$

7. Given: $f(0) = 7$, $f(4) = 0$,
 $f(1/3) = 0$, $f(5) = 2$

- a) name the factors
- b) name the zeros
- c) name the y-intercept

$f(0)=7$, $f(4)=0$, $f(1/3)=0$, $f(5)=2$

a) factors: $(x-4)(3x-1)$

b) zeros: 4, $1/3$

c) y-intercept: $(0, 7)$

8. Solve the system:

$$\begin{cases} x^3 + y^3 = 35 \\ x + y = -5 \end{cases}$$

$$x = -y - 5$$

$$(-y-5)^3 + y^3 = -35$$

$$-y^3 - 15y^2 - 75y - 125 + y^3 = -35$$

$$y^2 + 5y + 6 = 0$$

$$(y + 2)(y + 3) = 0$$

$$y = -2 \quad y = -3$$

$$(-3, -2) \text{ and } (-2, -3)$$

9. Find the zeros.
If irrational
leave in radical form.

$$f(x) = x^3 - 3x^2 + 9x + 13$$

$$\begin{array}{r|rrrr} -1 & 1 & -3 & 9 & 13 \\ & & -1 & 4 & -13 \\ \hline & 1 & -4 & 13 & 0 \end{array}$$

$$x^2 - 4x + 13 = 0$$

$$(x - 2)^2 = -13 + 4$$

$$(x - 2)^2 = -9$$

$$x = -1, 2 \pm 3i$$