

10/10/2018

③ $x^4 + x^3 - 3x^2 - 3x$ Write in factored form:
 $x(x^3 + x^2 - 3x - 3)$.

P: 1, 3

P.R.R: $\pm 1, \pm 3$.

Q: 1

$(1)^3 + (1)^2 - 3(1) - 3 = 1 + 1 - 3 - 3 = -4 \neq 0$.

$(-1)^3 + (-1)^2 - 3(-1) - 3 = -1 + 1 + 3 - 3 = 0$.

Synthetic division: divide by root (-1)

long division: divide by factor $(x+1)$.

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

$\Rightarrow x^2 - 3x$

$\Rightarrow x^2 + 0x - 3$.

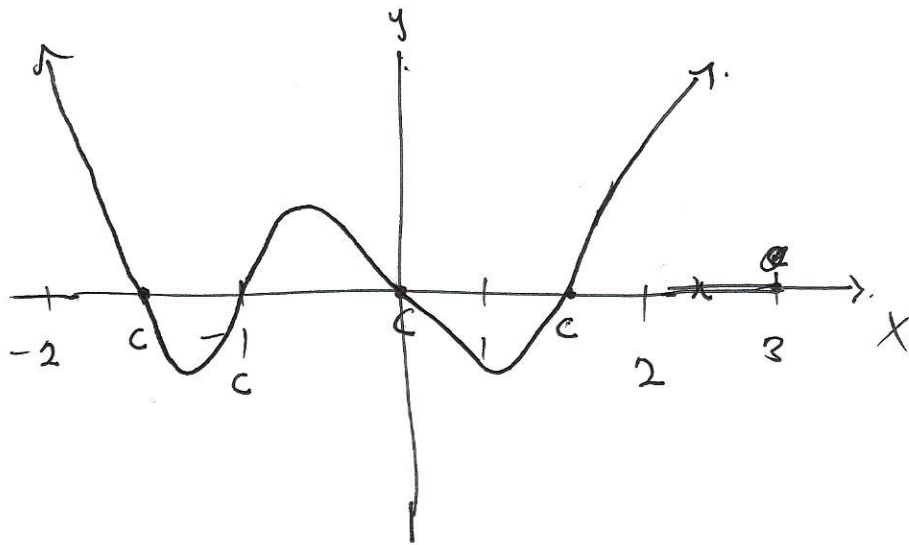
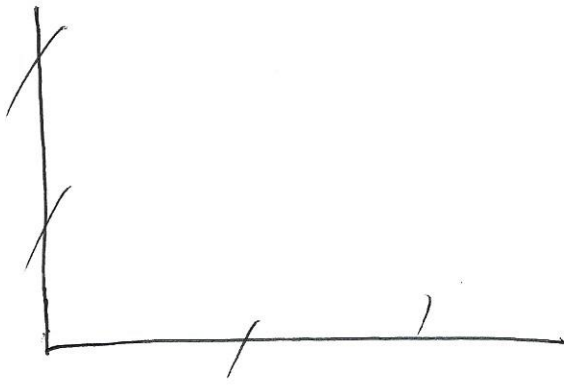
$\Rightarrow x(x+1)(x^2-3)$.

$\Rightarrow x(x+1)(x+\sqrt{3})(x-\sqrt{3})$.

\rightarrow E.B. L: up R: up.

Zeros: $x=0$ $x=-1$ $x=-\sqrt{3}$ $x=\sqrt{3}$

Mult: 1 1 1 1
 Cross Cross Cross Cross



Write

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

$$P: 1, 3, 5, 15.$$

$$Q: 1, 2$$

$$P:R:R: \quad \pm 1, \pm 3, \pm 5, \pm 15, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{5}{2}, \pm \frac{15}{2}$$

$$\begin{aligned} f(1) &= 2(1)^3 + 11(1)^2 + 2(1) - 15 \\ &= 2 + 11 + 2 - 15 = 0. \end{aligned}$$

$\Rightarrow (x-1)$ is a ~~root~~ factor.

Synthetic Division:

$$\begin{array}{r|rrrr} 1 & 2 & +11 & +2 & -15 \\ & & 2 & 13 & 15 \\ \hline & 2 & 13 & 15 & 0 \end{array}$$

$$\Rightarrow (x-1)2x^2 + 13x + 15.$$

$$(x-1)(2x+3)(x+5).$$

Rational Functions:

$$\frac{\text{Polynomial}}{\text{Polynomial}}$$

- Simplify a Rational Expression:

$$\frac{x^2 - 4x + 3}{x^2 - 5x + 6} = \frac{(x-3)(x-1)}{(x-3)(x-2)} = \frac{x-1}{x-2}$$

Restrictions:
($x \neq 3$) and $x \neq 2$.

Ex: $\frac{x^2 - 16}{x^3 + 3x^2 - 4x} = \frac{(x-4)(x+4)}{x(x^2 + 3x - 4)} = \frac{(x-4)(x+4)}{x(x+4)(x-1)}$

Restrictions: 0, -4, 1.

$$\frac{x-4}{x(x-1)}$$

$$\text{Ex } \frac{3}{x-1} + \frac{x-5}{x^2-1}$$

$$= \frac{3}{x-1} + \frac{x-5}{(x+1)(x-1)}$$

$$= \frac{3x+3}{(x+1)(x-1)} + \frac{x-5}{(x+1)(x-1)}$$

$$\text{d. } \frac{(x+1)}{(x+1)} \cdot \frac{3}{(x-1)} + \frac{x-5}{(x+1)(x-1)}$$

$$= \frac{3x-2}{(x+1)(x-1)} = \frac{2(2x-1)}{(x+1)(x-1)}$$