Sec. 2.7 Apply the Fundamental Theorem of Algebra

Find the zeros

$f(x) = x^4 - 6x^3 + 7x^2 + 6x - 8$

possible rational zeros : $\pm \frac{\text{factors of constant}}{\text{factors of LC}} = \pm \frac{p}{q}$

$\pm 1, \pm 2, \pm 4, \pm 8$

	4	3	2	1	0	
1	1	−6	7	6	−8	$x = 1$
		1	−5	2	8	
1	1	−5	2	8	0	
		1	−4	−2		
	1	−4	−2	6		

2	1	−5	2	8	$x = 2$
		2	−6	−8	
	1	−3	−4	0	

$(x-2) = 0$

$x^2 - 3x - 4 = 0$

$(x+1)(x-4) = 0$

$x + 1 = 0 \quad x - 4 = 0$

$x = -1 \quad x = 4$

Note: $x = 1, 2, -1, 4$

$f(x) = (x-1)(x-2)(x+1)(x-4) = 0$

$x - 1 = 0$

$x = 1$

Find the zeros

$f(x) = \underbrace{4}_{\text{den}}x^4 - 5x^2 + 42x \underbrace{-20}_{\text{num}}$

prz: $\frac{q}{1}$: $\pm 1, \pm 2, \pm 4, \pm 5, \pm 10, \pm 20$

2: $\pm\frac{1}{2}, \pm\frac{5}{2}$

4: $\pm\frac{1}{4}, \pm\frac{5}{4}$

	x^4	x^3	x^2	x^1	x^0	
1	4	0	−5	42	−20	
		4	4	−1	41	
	4	4	−1	41	21	✗

2	4	0	−5	42	−20	
		8	16	22	128	
	4	8	11	64	108	✗

4	4	0	−5	42	−20	
		16	64	236		↗
	4	16	59	278		✗

$\frac{1}{2}$	4	0	−5	42	−20	
		2	1	−2	20	
	4	2	−4	40	0	
$-\frac{5}{2}$		−10	20	−40		
	4	−8	16	0		

$x = \frac{1}{2}$ $x = -\frac{5}{2}$

$-\frac{5}{2}\cdot 4 = -\frac{20}{2}$

$-8 \cdot -\frac{5}{2} = \frac{40}{2}$

$\frac{4x^2}{4} - \frac{8x}{4} + \frac{16}{4} = \frac{0}{4}$

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

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{2 \pm \sqrt{4-4(1)(4)}}{2(1)} = \frac{2 \pm \sqrt{-12}}{2} = \frac{2 \pm 2i\sqrt{3}}{2}$

$a=1$, $b=-2$, $c=4$

$\frac{2}{2} \pm \frac{2i\sqrt{3}}{2} = 1 \pm i\sqrt{3}$

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

$-4 \quad -4$

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

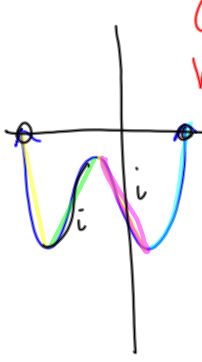
$(x-1)^2 = -3$

$\sqrt{(x-1)^2} = \pm\sqrt{-3}$

$x - 1 = \pm i\sqrt{3}$

$+1 \quad +1$

$x = 1 \pm i\sqrt{3}$



Apr 17-9:02 AM

$g(x) = x^4 - 9x^2 - 4x + 12$

prz: $\pm 1, \pm 2, \cancel{\pm 3}, \pm 4, \cancel{\pm 6}, \cancel{\pm 12}$

	4	3	2	1	0	
3	1	0	−9	−4	12	$x = 3$
		3	9	0	−12	
	1	3	0	−4	0	
1		1	4	4		
	1	4	4	0		$x = 1$

p. 142 (11, 13, 15)

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

$(x + 2)^2 = 0$

$x = -2$ $x = -2$

$f(x) = x^4 + 15x^2 - 16$

$\pm$

$-1, 1, 4i, -4i$

p. 142 (11, 13, 15)

p. 142 (11 - 15) odd