Find all of the zeros and write a linear factorization of the function

28) $f(x) = x^3 - 10x^2 + 44x - 69$

$$\begin{array}{c|cccc} 3 & 1 & -10 & 44 & -69 \\ & & 3 & -21 & 69 \\ \hline & 1 & -7 & 23 & 0 \end{array}$$

$x^2 - 7x + 23 = 0$

Zeros:

$x = 3, \ \frac{7}{2} + \frac{i\sqrt{43}}{2}, \ \frac{7}{2} - \frac{i\sqrt{43}}{2}$

$(x-3)(x^2-7x+23)$

$$\frac{-b}{2a} \pm \frac{\sqrt{b^2-4ac}}{2a}$$

$$\frac{7}{2(1)} \pm \frac{\sqrt{(-7)^2-4(1)(23)}}{2(1)}$$

$$\frac{7}{2} \pm \frac{\sqrt{49-92}}{2}$$

$$\frac{7}{2} \pm \frac{\sqrt{-43}}{2}$$

$$\frac{7}{2} \pm \frac{i\sqrt{43}}{2}$$

A) $f(x) = x^5 - 3x^4 - 5x^3 + 5x^2 - 6x + 8$

$$\begin{array}{c|cccccc} 1 & 1 & -3 & -5 & 5 & -6 & 8 \\ & & 1 & -2 & -7 & -2 & -8 \\ \hline -2 & 1 & -2 & -7 & -2 & -8 & 0 \\ & & -2 & 8 & -2 & 8 & \\ \hline 4 & 1 & -4 & 1 & -4 & 0 & \\ & & 4 & 0 & 4 & & \\ \hline & 1 & 0 & 1 & 0 & & \end{array}$$

$x^2 + 1 = 0$

$x^2 = -1$

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

$= \pm i$

Zeros:

$x = 1, -2, 4, \pm i$

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

Find all of the zeros and write a linear factorization of the function

$y = 3x^4 + 4x^3 + 2x^2 - x - 2$

-1	3	4	2	-1	-2
		-3	-1	-1	2
	3	1	1	-2	0
$\frac{2}{3}$		2	2	2	
	3	3	3	0	

$\frac{3x^2}{3} + \frac{3x}{3} + \frac{3}{3} = \frac{0}{3}$

$x^2 + x + 1 = 0$

$x^2 + x + \frac{1}{4} = -1 + \frac{1}{4}$

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

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

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

$\frac{2}{3}$

~~$(\frac{2}{3})3$~~

$\frac{-b}{2a} \pm \frac{\sqrt{b^2-4ac}}{2a}$

$\frac{-1}{2} \pm \frac{\sqrt{1^2-4(1)(1)}}{2}$

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

Zeros

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

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

Using the given zero find all of the zeros and write a linear factorization

33) $f(x) = x^4 - 2x^3 - x^2 + 6x - 6$ zero: $1 + i$

$1+i$	1	-2	-1	$+6$	-6
		$1+i$	-2	$-3-3i$	6
$1-i$	1	$-1+i$	-3	$3-3i$	0
		$1-i$	0	$-3+3i$	
	1	0	-3	0	

$x^2 - 3 = 0$

$x^2 = 3$

$x = \pm\sqrt{3}$

$(1+i)(-1+i)$

$-1 + i - i + i^2$

$-1 - 1$

$(1+i)(3-3i)$

$3 - 3i + 3i - 3i^2$

$3 - 3(-1)$

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

Write the function as a product of linear and irreducible quadratic factors all with real coefficients.

42) $f(x) = x^4 - 2x^3 + x^2 - 8x - 12$

-1	1	-2	1	-8	-12
		-1	3	-4	12
3	1	-3	4	-12	0
		3	0	12	
	1	0	4	0	

$x^2 + 4$

$y = (x+1)(x-3)(x^2+4)$

Find All possible Zeros

$f(x) = 3x^5 - 2x^4 + 6x^3 - 4x^2 - 24x + 16$

Zero $\sqrt{2}$ $-\sqrt{2}$

$\sqrt{2}(-2+3\sqrt{2})$

$-2\sqrt{2}+6$

$\sqrt{2}(12-2\sqrt{2})$

$12\sqrt{2}-4$

$\sqrt{2}(-8+12\sqrt{2})$

$-8\sqrt{2}+24$

$\sqrt{2}$	3	-2	6	-4	-24	16
		$3\sqrt{2}$	$6-2\sqrt{2}$	$-4+12\sqrt{2}$	$24-8\sqrt{2}$	-16
$-\sqrt{2}$	3	$-2+3\sqrt{2}$	$12-2\sqrt{2}$	$-8+12\sqrt{2}$	$-8\sqrt{2}$	0
		$-3\sqrt{2}$	$+2\sqrt{2}$	$-12\sqrt{2}$	$8\sqrt{2}$	
$\frac{2}{3}$	3	-2	12	-8	0	
		2	0	8		
	3	0	12	0		

$3x^2+12=0$

$x^2+4=0$

$x^2=-4$

$x=\pm 2i$

Zeros

$x = \frac{2}{3}, \sqrt{2}, -\sqrt{2}, 2i, -2i$