2.4. Zeros of polynomial functions.

Zeros of polynomial functions:

- are values of *x* that satisfy a polynomial function P(x) = 0.
- are determined by applying the Zero-Factor Property.
- are the same x values expressed as solutions of the equation P(x) = 0.
- are the same x values expressed as x-intercepts of the graph of the function P(x).
- are the same x values expressed as k in the factor (x k).

Example: If the zeros of polynomial $P(x) = 3x^3 - x^2 - 8x - 4$ are -1, $\frac{-2}{3}$, and 2, then

- x = -1, $x = \frac{-2}{3}$, and x = 2 are solutions of the equation P(x) = 0.
- P(-1) = 0, P(-2/3) = 0, P(2) = 0 are values that satisfy the P(x) = 0.
- (-1, 0); ($\frac{-2}{3}$, o); and (2, 0) are *x*-intercepts of the graph of the function P(x).

(x - (-1)) (x - (-2/3)) (x - (2)) or in simplified form (x + 1) (3x + 2) (x - 2) are factors of *P*.

In a previous lesson, we found zeros of polynomial functions by factoring.

Let's review.	
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STEPS TO FIND ALL ZEROS OF			
$P(x) = x^4 - 8x^2 + 16$	COMMENTS		
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$P(x) = x^4 - 8x^2 + $	If the degree of the polynomial is 4, then there are at		
16	most 4 distinct zeros.		
$P(x) = (x^2 - 4)(x^2 - 4)(x^$			
4) or $P(x) = (x^2 - 4)^2$	Factor the perfect square trinomial.		
P(x) = (x - 2)(x + 2)(x - 2)(x + 2)	Factor the difference of two squares.		
$ \begin{array}{rcl} (x-2) &= 0; & (x \\ + 2) &= 0; & (x - 2) \\ 2) &= 0; & (x + 2) \\ 2) &= 0 \end{array} $	Apply Zero-Factor Property 4 linear equations		
x = $2 \cdot x = -$	4 distinct zeros, but only 2 zeros each with multiplicity of 2.		

2; -2	<i>x</i> =	
Zeros are and -2	2	

Remember! Some zeros are *rational*, *irrational* or *complex*.

Find the zeros of $P(x) = x^3 + 8$. You will be prompted by responding to the quiz questions.

So, the zeros of the polynomial $P(x) = x^3 + 8$ are -2, $x = 1 + i\sqrt{3}$, $x = 1 - i\sqrt{3}$.

Here is another example to find all zeros of a polynomial given one zero. Again you will be prompted by responding to the following quiz questions.

Let's Review.

 $P(x) = x^4 + 10x^3 + 27x^2 + 10x + 26$; given the zero of *i*