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Algebra II

Remainder Theorem Extra Review

What do you need to know in order to determine the factors of a polynomial?

The zeros! If $(x-a)$ is a factor, then a is a zero

Write a possible polynomial equation in factored for if the zeros are:

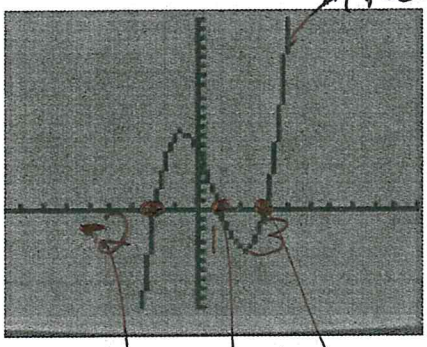
1. $\{-4, -2, 3\}$

$p(x)=(x+4)(x+2)(x-3)$

2. $\{0, 1, -2, 4\}$

$p(x)=x(x-1)(x+2)(x-4)$

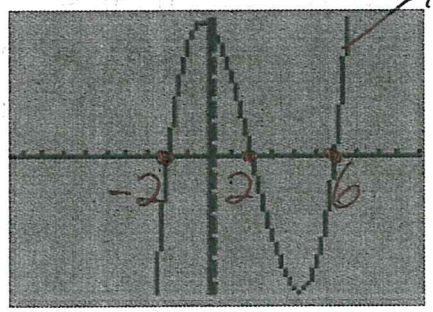
3.



Positive leading coefficient

$p(x)=(x+2)(x-1)(x-3)$

4.



Positive leading coefficient

$p(x)=(x+2)(x-2)(x-6)$

What do you need to know in order to determine the zeros of a polynomial?

The factors!

State the zeros for the following polynomials

1. $p(x) = (x+2)(x-4)(x+1)$

$x=-2 \quad x=4 \quad x=-1$

2. $p(x) = x(x-6)(x+3)$

$x=0 \quad x=6 \quad x=-3$

How do you find the remainder when a polynomial is divided?

Remainder Theorem! The remainder when $p(x)$ is divided by $(x-a)$ is $p(a)$. The binomial is a factor if the remainder is 0.

1. $p(x) = x^5 + 3x^4 - 4x^3 - 2x^2 + x - 3$
   $g(x) = x + 9$

$p(-9) = (-9)^5 + 3(-9)^4 - 4(-9)^3 - 2(-9)^2 + (-9) - 3$

$p(-9) = -36624$, therefore $x+9$ is not a factor

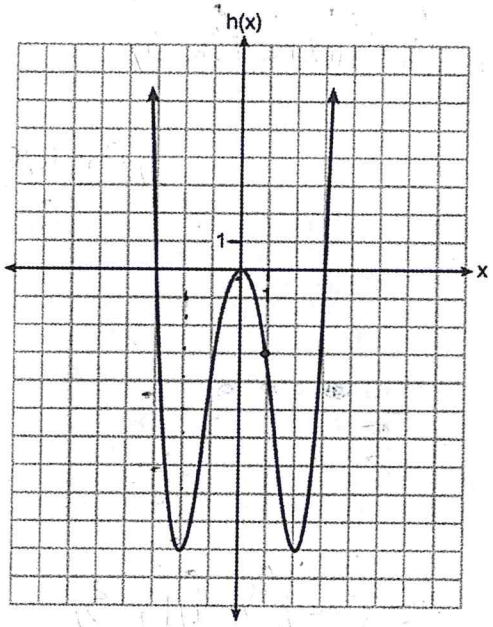
2. $p(x) = -2x^4 - 3x^3 + 9x - 10$
   $g(x) = x + 8$

$p(-8) = -2(-8)^4 - 3(-8)^3 + 9(-8) - 10$

$p(-8) = -6738$, therefore $x+8$ is not a factor

3. What is the remainder when the following polynomial is divided by:

a) $x-1$	b) $x+2$	c) $x-3$	d) x
$p(1) = -3$	$p(-2) = -10$	$p(3) = 0$	$p(0) = 0$
therefore $x-1$ is not a factor	therefor $x+2$ is not a factor	therefore $x-3$ is a factor	therefore x is a factor



How do you divide polynomials?

Synthetic Division

1. $\dfrac{4x^3 + 10x^2 + 10x - 1}{x - 2}$

$$\begin{array}{c|cccc} 2 & 4 & 10 & 10 & -1 \\ & & 8 & 36 & 92 \\ \hline & 4 & 18 & 46 & 91 \end{array}$$

$4x^2 + 18x + 46 + \dfrac{91}{x-2}$

2. $\dfrac{6x^3 - 5x + 3}{x - 3}$

$$\begin{array}{c|cccc} 3 & 6 & 0 & -5 & 3 \\ & & 18 & 54 & 147 \\ \hline & 6 & 18 & 49 & 150 \end{array}$$

$6x^2 + 18x + 49 + \dfrac{150}{x-3}$