Polynomials 2b - End Behavior (Factored Form)

Standards: A-SSE.1.a, A-SSE.1.b, F-IF.7c

HW#5: #1-2

GLO: #3 Complex Thinker

Math Practice:
Look for and express regularity in repeated reasoning.

Learning Target:
How can we find the degree, LC, and y-intercept quickly in factored form?

Oct 30-9:18 PM

Review from last time:

$+x^{even}$ $\quad\quad$ $-x^{even}$

$+x^{odd}$ $\quad\quad$ $-x^{odd}$

Question: *How can we determine the degree, leading coefficient, and y-intercept of a polynomial function written in factored form?*

An answer (the long one): *Use multiplication to first convert the polynomial to standard form.*

Practice: determine the degree, leading coefficient and y-intercept of the following functions by first rewriting the polynomial in standard form.

1) $f(x)=3x(x+1)(x-4)(x-2)$

$3x \quad x \quad x \quad x \rightarrow 3x^4$

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

$(x^2-3x-4)(x-2)$

$3x(x^3-5x^2+2x+8)$

	x^2	$-3x$	-4
x	x^3	$-3x^2$	$-4x$
-2	$-2x^2$	$+6x$	$+8$

$f(x)=3x^4-15x^3+6x^2+24x$

degree: 4 Lead. Coeff: 3 y-int: (0,0)

2) $f(x)=-2(2x+5)(x-3)^2$

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

	x	-3
$2x$	$2x^2$	$-6x$
$+5$	$+5x$	-15

$(2x^2-x-15)(x-3)$

$-2(2x^3-7x^2-12x+45)$

	$2x^2$	$-x$	-15
x	$2x^3$	$-x^2$	$-15x$
-3	$-6x^2$	$+3x$	$+45$

$f(x)=-4x^3+14x^2+24x-90$

degree: 3 LC: -4 y-int: (0,-90)

Another answer (the more efficient one):

- *The degree and leading coefficient can be determined by multiplying the leading term from each factor.*

- *The y-intercept can be determined by plugging in x=0 and evaluating.*

Practice: determine the degree, leading coefficient and y-intercept of the following functions by using the more efficient strategy described above.

1) $f(x)=(x-2)(x+5)(x+3)$

$x \quad x \quad x \rightarrow x^3$

$f(0)=(0-2)(0+5)(0+3)$
$=(-2)(5)(3)$
$=-30$

Degree: 3
LC: 1
y-int: (0,-30)

2) $f(x)=-5(x-1)^2(x+2)$

$-5(x-1)(x-1)(x+2)$
$-5 \quad x \quad x \quad x \rightarrow -5x^3$

$f(0)=-5(0-1)^2(0+2)$
$=-5(-1)^2(2)=-10$

Degree: 3
LC: -5
y-int: (0,-10)

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

$5x(3x-2)(x+4)(x+4)(x+4)$
$5x \quad 3x \quad x \quad x \quad x \rightarrow 15x^5$

$f(0)=5(0)(3(0)-2)(0+4)^3$
$=0(-2)(4)^3$

Degree: 5
LC: 15
y-int: (0,0)

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

$(x+1)(x+1)(x-4)(-2x+3)(-2x+3)$
$x \quad x \quad x \quad -2x \quad -2x \rightarrow 4x^5$

$f(0)=(0+1)^2(0-4)(-2(0)+3)^2$
$=(1)^2(-4)(3)^2$
$=(1)(-4)(9)=-36$

Degree: 5
LC: 4
y-int: (0,-36)