## Unit 2 Lesson 10: Multiplicity

### 1 Notice and Wonder: Duplicate Factors (Warm up)

#### Student Task Statement

What do you notice? What do you wonder?

$y=\left(x−3\right)^{2}$



$y=\left(x+1\right)\left(x−3\right)^{2}$



$y=\left(x−3\right)^{3}$



$y=\left(x−6\right)\left(x−3\right)^{2}$



### 2 Sketching Polynomials

#### Student Task Statement

1. For polynomials $A$–$F$:
	1. Write the degree, all zeros, and complete the sentence about the end behavior.
	2. Sketch a possible graph.
	3. Check your sketch using graphing technology.
	* Pause here for your teacher to check your work.
2. Create your own polynomial for your partner to figure out.
	1. Create a polynomial with degree greater than 2 and less than 8 and write the equation in the space given.
	2. Trade papers with a partner, then fill out the information about their polynomial and complete a sketch.
	3. Trade papers back. Check your partner’s sketch using graphing technology.

$A\left(x\right)=\left(x+2\right)\left(x−2\right)\left(x−8\right)$

Degree:                     Zeros:
End behavior: As $x$ gets larger and larger in the negative direction,



$B\left(x\right)=-\left(x+2\right)\left(x−2\right)^{2}$

Degree:                     Zeros:
End behavior: As $x$ gets larger and larger in the negative direction,



$C\left(x\right)=\left(x+6\right)\left(x+2\right)^{2}$

Degree:                     Zeros:
End behavior: As $x$ gets larger and larger in the negative direction,



$D\left(x\right)=-\left(x+6\right)^{2}\left(x+2\right)$

Degree:                     Zeros:
End behavior: As $x$ gets larger and larger in the negative direction,



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$E\left(x\right)=\left(x+4\right)\left(x−2\right)^{3}$

Degree:                     Zeros:
End behavior: As $x$ gets larger and larger in the negative direction,



$F\left(x\right)=x^{3}\left(x+4\right)\left(x−3\right)^{2}$

Degree:                     Zeros:
End behavior: As $x$ gets larger and larger in the negative direction,



Your polynomial:

Degree:                     Zeros:
End behavior: As $x$ gets larger and larger in the negative direction,



### 3 Using Knowledge of Zeros (Optional)

#### Student Task Statement

1. Sketch a graph for a polynomial function $y=f\left(x\right)$ that has 3 different zeros and $f\left(x\right)\geq 0$ for all values of $x$.
* 
1. What is the smallest degree the polynomial could have?
2. What is a possible equation for the polynomial? Use graphing technology to see if your equation matches your sketch.



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