Connecting Zeros and Factors

Name:_____

Directions: The objective of this activity is to help you understand the connections between zeros, factors, and polynomial division. Please use complete sentences wherever it says "explain".

1. Please completely factor the number 105. Start with factoring out a 7. Then write the number in its fully factored form. (Show the long division.) Completely factored form:_____	2. Please explain your process in #1.
3. Consider the following function. Completely factor it, starting with factoring out an "x". (Show the long division.) $f(x) = x^2+3x$ Factored form: $f(x)$=_____	4. Without using a calculator tell me what the zeros are in #3. Also, explain your process.
5. Quite often when you are asked to factor a polynomial you will not be given a factor. How do you find easy factors quickly?	6. Without doing any division completely factor the following polynomial using your method from #5. $f(x) = x^4 + 2x^3 - 72x^2 - 18x + 567$ Factored form:$f(x)$_____
7. Unfortunately, not all factors are that easy to come by. Sometimes we have to factor out (divide out) the "easy-to-find" factors and go from there. Find the easy factors in the following polynomial using your method from #5. $f(x) = x^4 - x^3 - 9x^2 +3x +18$ Easy Factors:_____	8. Now, use your method from #3 to factor the polynomial the rest of the way. Please also list all the zeros. (You may use long division or synthetic division.) Completely Factored Form:_____ All real zeros:_____

9. Now that you are warmed up completely factor the following function. Also list all the zeros of the function.

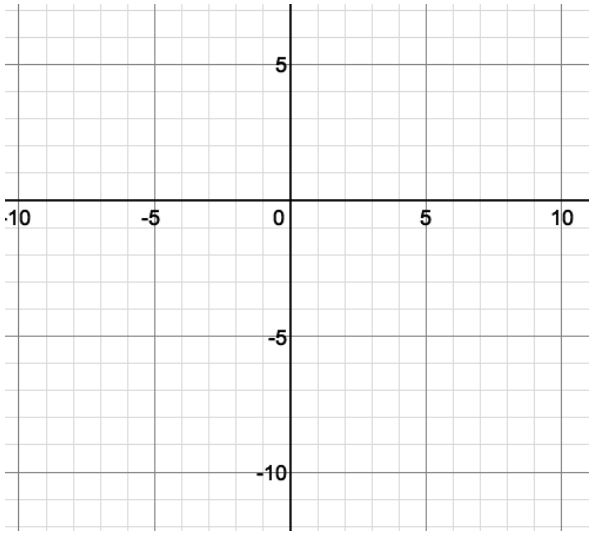
$f(x)=x^4 - 9x^3 +18x^2 + 32x - 96$

Completely Factored form:_____

All zeros:_____

10. How many zeros did you expect to find in #9 based on the degree of the polynomial? Is that how many you found? Based on your completely factored form, were there any repeated factors?

11. Sketch a graph of the function from #9. Is there anything special happening on the graph at the repeated zero? What is it?



12. Make a conjecture about what might be true about repeated factors and what they look like graphically. (If you are still struggling to make a conjecture, graph some functions with repeated factors and see what you notice.)

13. Does it matter if the factors are repeated an even or odd number of times? Write a conjecture about factors that are repeated an odd number of times and an even number of times.

14. **Blog post Assignment**: Bring it all together. Explain the connection between factors and zeros. How does division help us to factor polynomials? How does the degree of the polynomial help us to predict the number of zeros? Does that always tell us the number of factors? Why or why not?