Algebra II | Activity 1107 | Name:
Dr. Paul L. Bailey | Monday, November 7, 2022

Definition 1. Let D be a set and let $f : D \to \mathbb{R}$. We say that $x \in D$ is a *zero* of f if $f(x) = 0$.

Definition 2. let f be a polynomial. To *completely factor* f means to factor f into a product of linear factors. There will be $\deg(f)$ such factors.

Definition 3. Let f be a polynomial and let a be a number. The *multiplicity* of a as a zero of f is the largest n such that $(x-a)^n$ divides f.

Problem 1. Consider the polynomial $f(x) = (x-1)(x+7)^2(x-2)^3(3x-2)(x+8)$. Find the multiplicity the following numbers.

Number	1	2	7	-7	3/2	2/3
Multiplicity						

Problem 2. Let $f(x) = 7x^2 - x^3$. Completely factor f. Find the multiplicity of each of the zeros of f.

Problem 3. Let $f(x) = x^2 - 6x + 9$. Completely factor f. Find the multiplicity of each of the zeros of f.

Problem 4. Let $f(x) = x^3 - 2x^2 + 4x - 8$. Completely factor f. Find the multiplicity of each of the zeros of f.

Problem 5. Let $f(x) = x^3 - x^2 - 4x + 4$. Use the technique we called "Factor by Grouping" to completely factor f. Find the multiplicity of each of the zeros of f.

Problem 6. Let $f(x) = x^3 - 5x^2 + 7x - 3$. Note that $f(1) = 0$, so $f(x) = (x - 1)q(x)$ for some quadratic polynomial $q(x)$. Use synthetic division to factor out $x - 1$ and find $q(x)$. Factor $q(x)$. Find the multiplicity of each of the zeros of f.

Problem 7. Let $f(x) = x^3 - 2x^2 + 4x - 8$. Factor f into linear factors. Find the multiplicity of each of the zeros of f.

Problem 8. Let $f(x) = 3x^2 - 17x + 10$. Suppose that $f(x)$ factors as $f(x) = (3x + p)(x + q)$. Find p and q.