Math 115E Activity 21

Chapter 7: Polynomials
Multiplicities

Multiplicities of Polynomials

Reminder: *Given a function $f(x)$,*

- *The x-intercepts are the coordinate points of the form $(x, 0)$ on the graph $f(x)$*
- *The y-intercept is the coordinate points of the form $(0, f(0))$ on the graph of $f(x)$*

Definition: *Given a polynomial $f(x)$, the number of times a given term $(x - c)$ appears in the factored form of $f(x)$ is called the* ***multiplicity***

Example: If we have the polynomial: $g(x) = (x-1)(x-2)^4(x+3)^3(x+4)^2$

- Then we can say the following solutions are $x = 1, x = 2, x = -3, x = -4$
- Now, notice that: $x = 1$ has a multiplicity of 1, and $x = 2$ has a multiplity of 4
  $x = -3$ has a multiplicity of 3, and $x = -4$ has a multiplity of 2
- The y-intercepts is at $f(0) = (0-1)(0-2)^4(0+3)^3(0+4)^2 = (-1)(-2)^4(3)^3(4)^2 = -6912$
- The x-intercepts are at $0 = f(x)$ which are $(1, 0), (2, 0), (-3, 0), (-4, 0)$

For the following problems, find the x-intercepts and their multiplicities, and the y-intercepts

#1 $f(x) = (x-2)^3(x-1)$

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

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

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

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

Graphing Polynomials