Estimating and Graphing Polynomials LCHL

Using Geogebra, graph the following polynomials and fill in the table below after graphing each one

NOTE: to put indices into an equation use <mark>SHIFT</mark> **and** <mark>6</mark> on keyboard to get ^ symbol, then type degree required [e.g for $(x-5)^2$ you'd type in ^2]

Polynomial	Leading coefficient (term with biggest degree/power) positive or negative?	Equation of degree?	Number of roots?	List of roots	Where it crosses x=axis	Where it touches (but doesn't cross) x-axis	End behaviour = Direction of ends/arms (up or down) Both same/different/which up/which down
$f(x) = x(x-1)(x-2)(x-3)$	+1	4	4	0,1,2,3	0,1,2,3	n/a	Both up
$f(x) = x\ (x\ -\ 2)\ (x+5)$	+1	3	3	-5,0,2	-5,0,2	n/a	Left down, right up
$y = x(x+4)(x-7)(x-2)(x-5)^2$	+1	6	6	-4,0,2,5,7	-4,0,2,7	5	Both up
$y = (-x)(x+4)(x-2)(x-5)^2$	-1	5	5	-4,0,2,5	-4, 0,2	5	Left up, right down
$y = (x)^2(x+2)^3$	+1	5	5	-2,0	-2	0	Left down, right up
$y = x^5 - 12x^4 - 40x^3 + 120x^2$	+1	5	5	-4.22, 0,2,14.22	-4.22,2,14.22	0	Left down, right up
$y = -x(x+3)(x+4)^3$	-1	5	5	-4,-3,0	-4,-3,0	n/a	Left up, right down

(Reflection: What examples above have the same characteristics? Is there a pattern to how each graph looks compared to the equation?)

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What conclusions can you draw from your graphs and table about the following:

A polynomial of even degree? Similar characteristics to quadratics. Both arms up if leading coefficient positive. (or down if leading coefficient negative)
A polynomial of odd degree? Similar to cubics, if leading coefficient positive then graph goes up from left to right (left arm down, right up). If leading coefficient negative, then graph goes down from left to right (left arm up, right arm down)
The leading coefficient is positive? Both arms up, if even degree. Graph goes up if odd degree
The leading coefficient is negative? Both arms down, if even degree. Graph goes down if odd degree
Polynomial which has a factor or root which occurs multiple times (known as Multiplicity)? Stationary point at this location
Polynomial which has a factor or root which occurs 2 times? Turning point is here
Polynomial which has a factor or root which occurs 3 times? Horizontal stationary point is here (both f'(x) and f''(x)=0 at this point)

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