What did We Learn from the Four Quartic Functions We Graphed Yesterday?

- We can identify all of our x-intercepts from the factored version of the function
- If a factor is twice repeated (ie. $(x-2)^2$ or $(x+3)^2$) , then the intercept at that value will be a "touch" point
- If a factor is tripled (ie. $(x-2)^3$ or $(x+1)^3$), then there will be a point of inflection at the x-intercept
- A regular factor (ie. (x+2) or (x-4)) will indicate that the function just crosses through the x-axis at that point

- We can determine the end behaviours from the factored version of the graph by determining the degree and looking to see if lead factor is positive or negative

- We can determine the y-intercept from factored form by setting all x's equal to zero

Examples:

1) $f(x)=(x-2)(x+3)(x-4)$ degree is 3 (positive lead) , x-intercepts @ x=2, x=-3, x=4 , y-intercept @ y=24

2) $f(x)=-(x)(x+3)(x-4)$ degree is 3 (negative lead) , x-intercepts @ x=0, x=-3, x=4 , y-intercept @ y=0

3) $f(x)=(x-1)^2(x+3)(x-4)$ degree is 4 (positive lead) , x-intercepts @ x=1, x=-3, x=4 , y-intercept @ y=-12
** with a touch point at x=1**

4) $f(x)=-(x-2)^3(x+1)^2(x-5)$ degree is 6 (neg lead) , x-intercepts @ x=2, x=-1, x=5 , y-intercept @ y=-40
** with a touch point at x=-1 and a point of inflection at x=2**

What Role do Factors Play?

Now that we have established a deeper understanding of the role that dominant terms, lead coefficients and factors have on the look of a graph, we are ready to "role" :

Each of the functions are already expressed in **factored form**.
Sketch the graph of each of the following polynomial functions. Your sketch should include proper end behaviours, correct x-intercepts (remember to consider what happens with repeated factors!) and a correct y-intercept.

a) $f(x)=(x-4)(x+3)$

b) $f(x)=-(x-1)(x+4)(x-\frac{1}{2})$

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

d) $f(x)=2x(x-2)^2$

e) $f(x)=-(2x-3)^2(x+2)^2$

f) $f(x)=x(x-2)(x+1)(2x+3)$

g) $f(x)=x^3(x-4)$

h) $f(x)=-(x+3)^2(x-3)^3$

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

*** solutions to the graphs are on the website