

Day 4: 1.2-Characteristics of Polynomial Functions

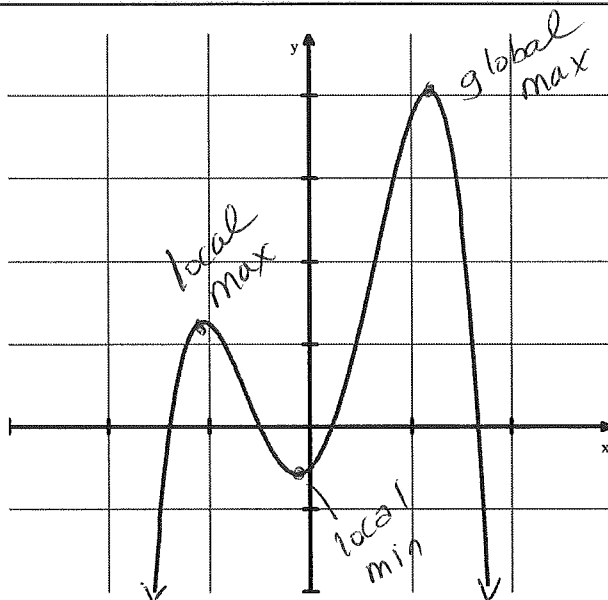
Key Terms:

Local minimum: is the point on a function that has the least y-value on some interval close to the point

Local maximum: is the point on a function that has the greatest y-value on some interval close to the point

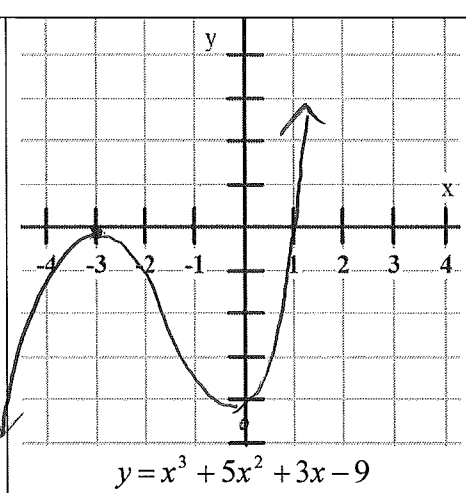
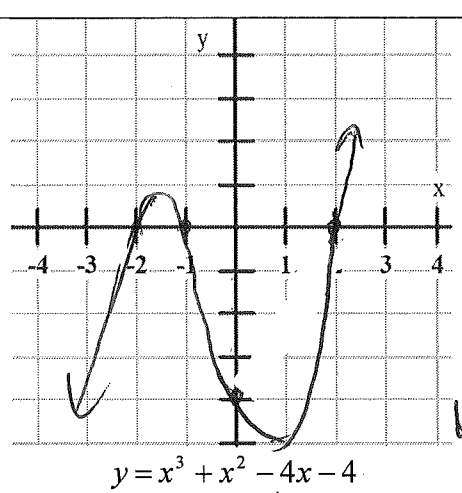
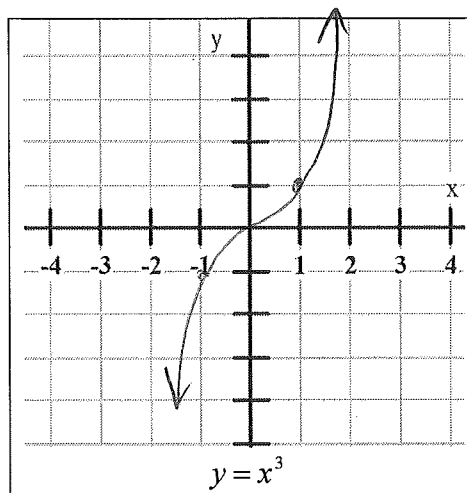
Global maxima/minima: is the absolute max or min points of the function

Turning points: are all local maxima/minima points



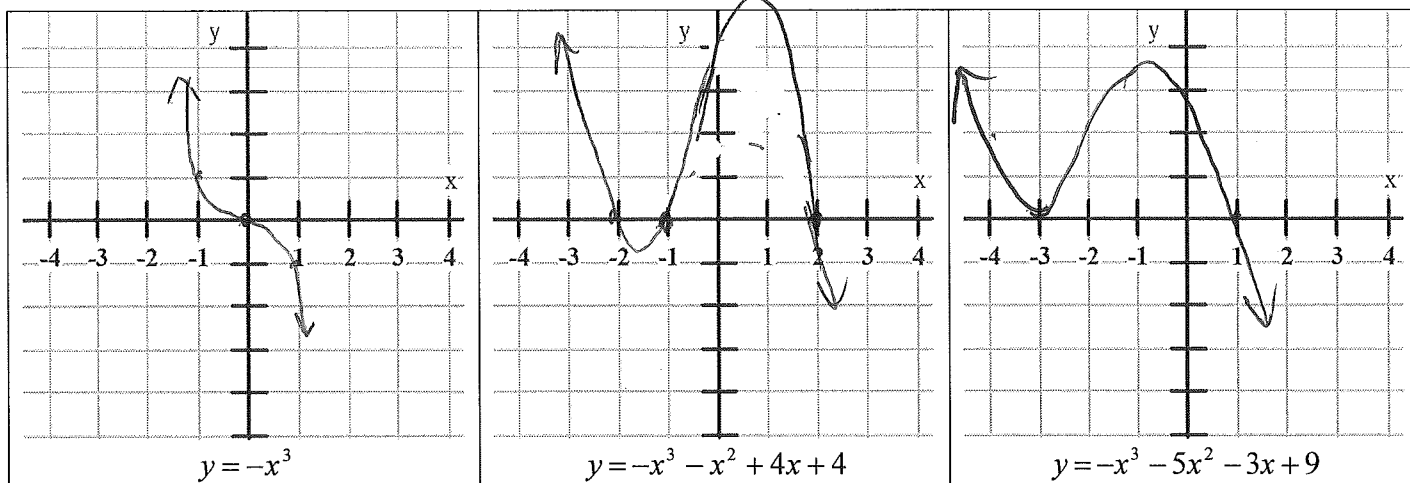
Let's investigate!

Using *Desmos graphing software*, sketch a graph of the following odd-degree functions:



$$= x^2(x+1) - 4(x+1)$$

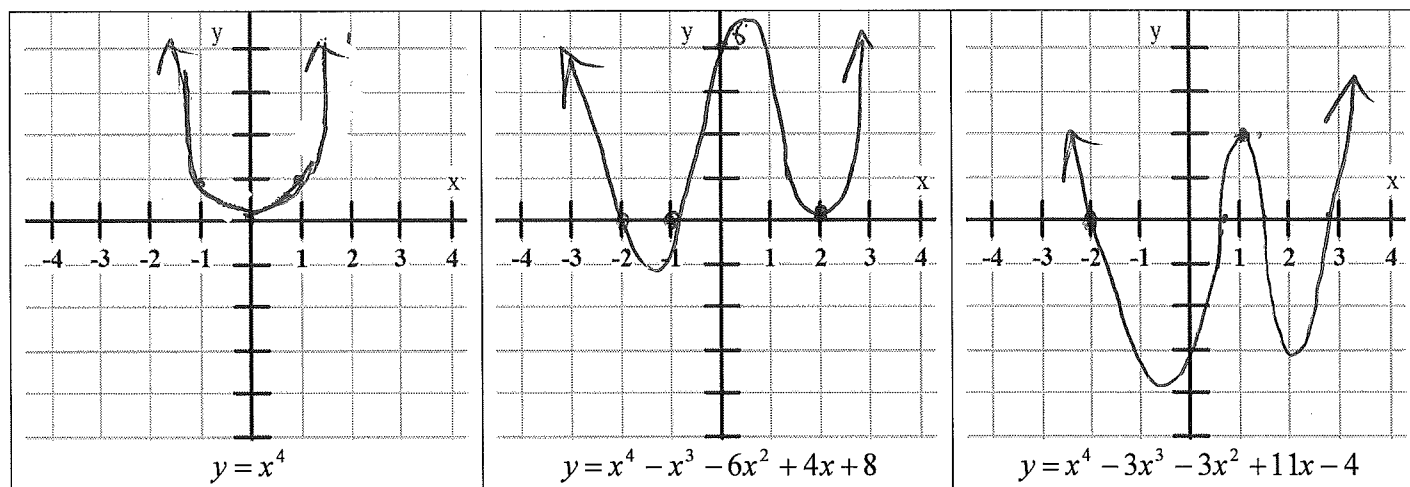
$$= (x+1)(x-2)(x+2)$$

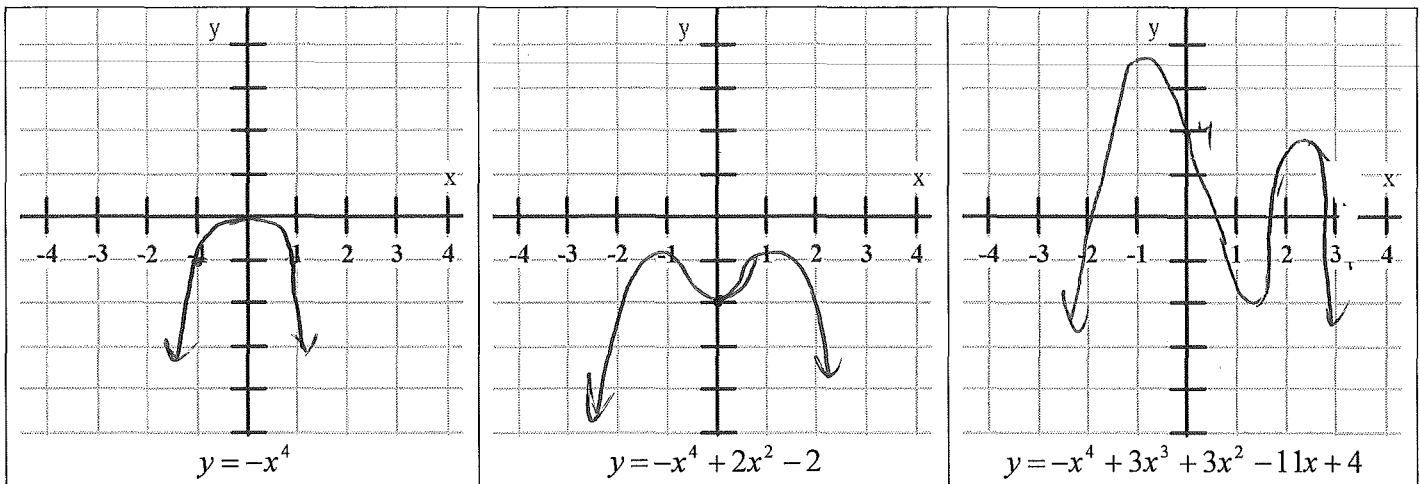


What can we assume about odd-degree functions based on the graphs above?

End behavior	$x \rightarrow \infty \quad y \rightarrow \infty$ $x \rightarrow -\infty \quad y \rightarrow -\infty$	$x \rightarrow \infty \quad y \rightarrow -\infty$ $x \rightarrow -\infty \quad y \rightarrow \infty$
x - intercepts	at least one x-intercept	
Global maxima/minima	no global max/min	
Turning points	can have 0 turning points or 2 or 4 or ... max (n-1) turning points.	

Using *Desmos* graphing software, sketch a graph of the following even - degree functions:





What can we assume about even-degree functions based on the graphs above?

End behavior	$x \rightarrow \infty \quad y \rightarrow \infty$ $x \rightarrow -\infty \quad y \rightarrow \infty$ or $x \rightarrow \infty \quad y \rightarrow -\infty$ $x \rightarrow -\infty \quad y \rightarrow -\infty$
x - intercepts	can have 0 x-intercepts (up to n x-intercepts)
Global maxima/minima	will always have a global max/min depending on the sign of leading coefficient.
Turning points	at least 1 turning point or 3 or 5, ... max n-1

In summary:

Odd-Degree Functions		Even-Degree Functions	
Positive leading coefficient	$x \rightarrow \infty \quad y \rightarrow \infty$ $x \rightarrow -\infty \quad y \rightarrow -\infty$	Positive leading coefficient	$x \rightarrow \infty \quad y \rightarrow \infty$ $x \rightarrow -\infty \quad y \rightarrow \infty$
Negative leading coefficient	$x \rightarrow \infty \quad y \rightarrow -\infty$ $x \rightarrow -\infty \quad y \rightarrow \infty$	Negative leading coefficient	$x \rightarrow \infty \quad y \rightarrow -\infty$ $x \rightarrow -\infty \quad y \rightarrow -\infty$
Number of x - intercepts	at least one, max n	Number of x - intercepts	0 (min) n (max)
Number of absolute max/min points	None	Number of absolute max/min points	absolute min $a > 0$ absolute min $a < 0$

All polynomial functions with a degree n , will have at most $n-1$ turning points.