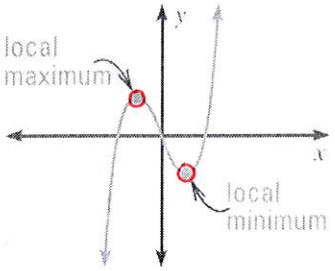
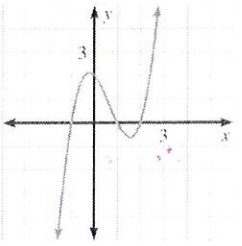
Section:	**2 – 8 Analyze Graphs of Polynomial Functions**
Essential Question	When does a graph have a local maximum or local minimum?

Key Vocab:

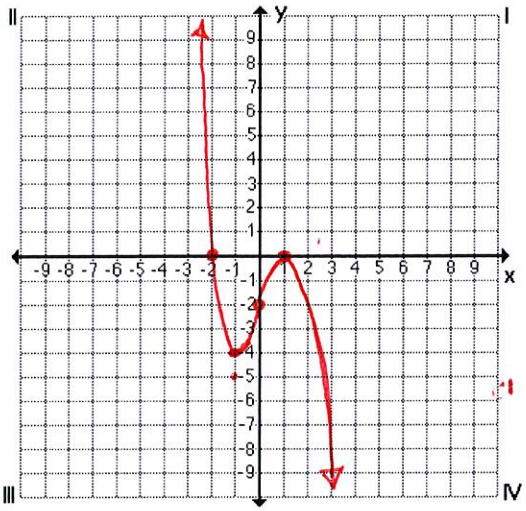
Turning Point	Point at which a graph changes from increasing to decreasing or vise versa. →Think vertex of a parabola. **Note:** Turning points occur on the x-axis when a zero has an even repetition, i.e. double root, quadruple root, etc.	 - Both are turning points
Local Maximum	The y-coordinate of a turning point, if the point is higher than all other nearby points. Typically, it is a turning point on the graph.	
Local Minimum	The y-coordinate of a turning point, if the point is lower than all nearby points. Typically, it is a turning point on the graph.	

Key Concept:

Turning Points of a Polynomial Function	
The graph of every polynomial function of degree n has ***at most*** $n-1$ turning points.	**Example:** $f(x)=x^3-2x^2-x+2$  Degree = 3 → 2 Turning Points (3 real zeroes)
If a polynomial function has n distinct real zeroes(no repeated solutions), then its graph has ***exactly*** $n-1$ turning points.	

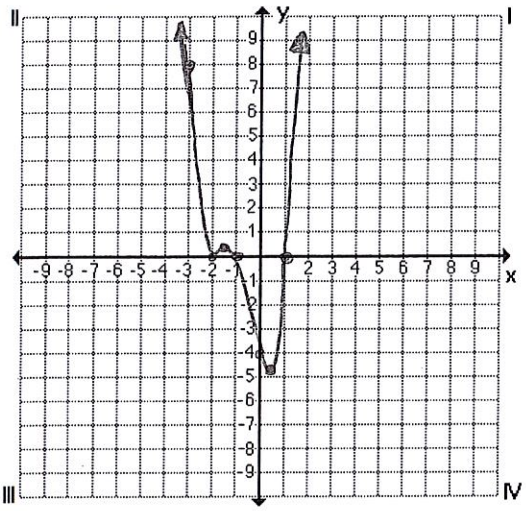
Show:

Ex 1: Graph the function $f(x)=-(x+2)(x-1)^2$



x	y
-2	0
-1	-4
0	-2
1	0
2	-4

Ex 2: Graph the function $f(x) = x^4 + 4x^3 + 3x^2 - 4x - 4$. Identify the x-intercepts and the points where the local maximums and local minimums occur.



x	y
-3	8
-2	0
-1	0
0	-4
1	0

Local max: (-1.4, 0.3)

Local min: (-2, 0) (0.4, -4.8)

x-intercepts: -2, -1, 1

Ex 3: You are making a rectangular box out of a 12-inch by 15 inch-piece of cardboard. The box will be formed by making the cuts shown in the diagram and folding up the sides. What is the maximum possible volume for the box?

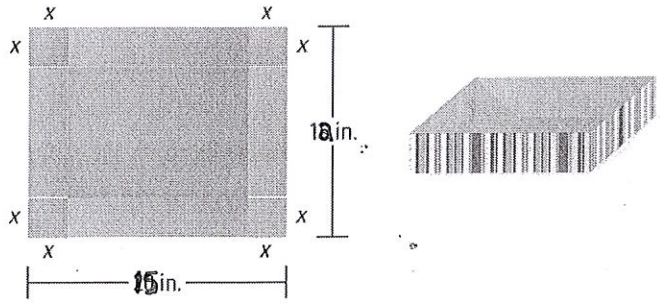
$V = l \cdot w \cdot h$

$V = (15-2x)(12-2x)x$

$V = x(180 - 54x + 4x^2)$

$V = 4x^3 - 54x^2 + 180x$

Maximum occurs at $x \approx 2.2$



Max Volume ≈ 177 in^3

Closure:

- Must the graph of a function always *cross* the x-axis at its real zeroes? Explain.

It must hit that point on the x-axis, but not necessarily cross.

Ex: