

Polynomial Functions

Polynomial Functions and Their Graphs (Patterns of Polynomials)

Name: _____

Fill out this table. Sketch the graph of this function using the critical points.

Function	$f(x) = \frac{1}{4}(x-1)(x+3)$	$f(x) = \frac{1}{4}(x-1)(x+3)^2$	$f(x) = -\frac{1}{4}(x-1)(x+3)(x-3)$	$f(x) = \frac{1}{4}(x-1)(x+3)^2(x-3)$
Leading Coefficient "a"	$\frac{1}{4}$	$\frac{1}{4}$	$-\frac{1}{4}$	$\frac{1}{4}$
Degree (count factors)	2	3	3	4
Number of Linear Factors (same as degree)	2	3	3	4
End Behavior (use arrows)	(\uparrow, \uparrow)	(\downarrow, \uparrow)	(\uparrow, \downarrow)	(\uparrow, \uparrow)
Number of Turning Points	1	2	2	3
y-intercept	$\frac{1}{4}(-1)(3) = -0.75$	$\frac{1}{4}(-1)(3)(3) = -2.25$	$-\frac{1}{4}(-1)(3)(-3) = -2.25$	$\frac{1}{4}(-1)(3)(3)(-3) = -6.75$
Number of Real Zeros	Crossing: $X=1$ $X=-3$ Touching: Total: 2	Crossing: $X=1$ $X=-3$ Touching: $X=-3$ Total: 3	Crossing: $X=1$ $X=-3$ Touching: $X=-3$ Total: 3	Crossing: $X=1$ $X=3$ Touching: $X=-3$ $X=-3$ Total: 4
Sketch of Graph put dots on zeros and y-intercept				

Function	$f(x) = -\frac{1}{4}(x-1)(x+3)^2(x-3)$	$f(x) = \frac{1}{4}(x+1)(x-1)(x+3)(x-3)$	$f(x) = -\frac{1}{4}(x-1)^2(x+3)^2(x-3)$	$f(x) = \frac{1}{4}(x+1)(x-1)(x+2)(x-3)(x+3)$
Leading Coefficient	$-\frac{1}{4}$	$\frac{1}{4}$	$-\frac{1}{4}$	$\frac{1}{4}$
Degree	4	4	5	5
Number of Linear Factors	4	4	5	5
End Behavior	(<u>↓</u> , <u>↓</u>)	(<u>↑</u> , <u>↑</u>)	(<u>↑</u> , <u>↓</u>)	(<u>↓</u> , <u>↑</u>)
Number of Turning Points	3	3	4	4
y-intercept	-6.75	2.25	6.75	4.5
Number of Real Zeros	Crossing: $x=1$ $x=3$ Touching: $x=-3$ Total: 4	Crossing: $x=-1$ $x=1$ $x=-3$ $x=3$ Touching: Total: 4	Crossing: $x=3$ Touching: $x=1$ $x=-3$ Total: 5	Crossing: $x=-1$ $x=1$ $x=-2$ $x=3$ $x=-3$ Touching: Total: 5
Sketch of Graph				

The maximum possible number of turning points is one less than the degree of the polynomial.

The maximum possible number of zeros of a polynomial is equal to its degree.

Touching zeros have even multiplicity. Crossing zeros have odd multiplicity.