**Always, Sometimes, or Never True?**

Directions: Read the statement, then circle the appropriate classification of the statement. Include an example that supports your classification, and a non-example if it applies.

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| Statement | Classification | Example/Counterexample |
| Cubic means the highest power of x is 3. | Always True  Sometimes True  Never True | Reason: The degree of the polynomial is always determined by the highest power of x. |
| A quadratic will have two x-intercepts because it makes a U shape. | Always True  Sometimes True  Never True | Depending on the equation, it may never intersect the x-axis. There will always be two zeroes for the equation, but they may not always be real or unique.  Example: x2 – 4x – 12  Counter Examples:  One x-intercept x2  No x-intercepts 3x2 +1 |
| An odd degree will always have an x-intercept. | Always True  Sometimes True  Never True | Since the end behavior is in different directions, the x-axis will be intersected eventually. |
| The function y=2x2-3x+6 has two zeros. | Always True  Sometimes True  Never True | Neither of the zeros are real, but there are two zeros. |
| Polynomials make curved lines when graphed. | Always True  Sometimes True  Never True | Linear and constant equations are types of polynomials; polynomials and their graphs are lines.  Example of a curved graph: x4-2x3+x-1  Example of linear: Any y=mx+b, where m, b are real numbers.  Example of a constant function: y = a, where a is any real number. |
| The leading coefficient determines how steep the curve is. | Always True  Sometimes True  Never True | Yes, the leading coefficient does influence steepness, but so do the other coefficients. The exception would be the coefficient associated with x0 power, which does not dilate the graph. |
| A polynomial must have at least three terms. | Always True  Sometimes True  Never True | Another way to describe a polynomial is by the number of terms of which it is composed. 1 term = monomial, 2 terms = binomial, 3 terms = trinomial. |
| The number of intercepts depends on the highest degree. | Always True  Sometimes True  Never True | The degree of the polynomial will tell you the maximum number of zeros a polynomial can potentially have. Since some zeros are not real, they may not intercept the x-axis. Similarly, zeros with an even multiplicity will touch the x-axis, but will not pass through it. For example, a quadratic can have a maximum number of 2 intercepts. This would be the case for something like y=x2 – 4. However, if the multiplicity of the zero is even in the case of y=x2-4x+4, then there will be only one zero. Finally, in y=x2 +5, there are no real solutions to the polynomial and it therefore has no real solutions, meaning its roots fall in the complex set of numbers. |
| The function y=x5+3x3+7 has one real solution. | Always True  Sometimes True  Never True | The solution is x= -1.35 |
| Polynomials with an even degree have the same end behavior. | Always True  Sometimes True  Never True |  |
| 4th degree polynomial functions look similar to quadratic functions. | Always True  Sometimes True  Never True | Yes, y=x4 looks like a fat parabola, but not all of them have that appearance. |
| Cubic graphs will continuously increase, therefore don’t have a minimum or maximum. | Always True  Sometimes True  Never True | If the cubic function is a monomial, in the case of y=x3, then there will be a point of constant slope at x=0, which means the function is neither increasing nor decreasing at that point.  An example of a cubic polynomial with both increases and decreases would be y=x3-x+1. There are two intervals where the function is increasing and one where it is decreasing.  An example of a cubic polynomial that always increases would be something like y=x^3+x. This will only occur when the cubic function’s derivative (a quadratic) has no real solutions. |
| Polynomials with an odd degree will have opposite end behavior. | Always True  Sometimes True  Never True |  |
| The number of turning points depends on the highest degree of the function. | Always True  Sometimes True  Never True | The number of turns can be anywhere from 0 to n-1, for an nth degree function. |
| The constant effects the steepness of the curve. | Always True  Sometimes True  Never True | The constant determines where the graph is in relation to the x-axis. |