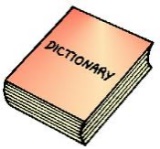
**6.1 Exploring the Graphs of Polynomial Functions**



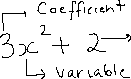
**By the end of the lesson you will be able to:**

1. From a graph identify the following characteristics of a function: type (constant, linear, quadratic and cubic), degree, x-intercepts, y-intercepts, end behavior, domain, range and number of turning points.

**Terms**

**Expressions** are numbers, symbols and operators (such as + and ×) grouped together that show the value of something.

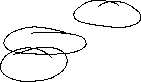
Example:



**Terms**: Are separated by \_\_\_\_ or \_\_\_\_



* Letters are **variables** and represent an unknown and changeable quantity.
* **Coefficients** are the numbers multiplied with the variables.

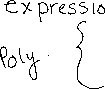


* **Constant** is a number by itself.

A **polynomial** (poly - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ nomial - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) is an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with 2 or more.



For example,



A **function** is a special relationship where every \_\_\_\_\_\_\_\_\_ (\_\_\_\_) gives one and only one \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (\_\_\_).



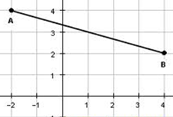
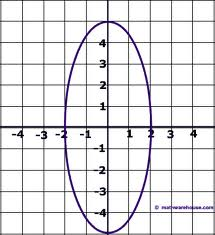
On a graph we can test if something is a function by doing a **vertical line test.**  If we find a spot where

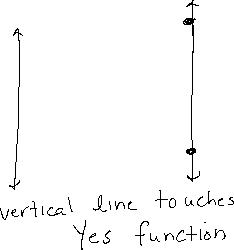


we can draw a vertical line ( ) and the line touches the graph 2 or more times, we know that we \_\_\_\_\_\_\_\_\_\_\_\_\_\_ have a function.



For example,



**Qualities of Polynomial Functions**



**X-intercept** is the place that the graph crosses the \_\_\_\_\_\_\_\_\_\_\_\_\_.



We can solve for the **x-intercept** by reading it off the graph or plugging \_\_\_\_\_\_\_\_\_\_\_ into the expression and solving for x.



**Domain** is the set of all possible \_\_\_\_\_ or \_\_\_\_\_\_\_\_\_ values and is expressed using an inequality or if all values are possible, we say \_\_\_\_\_\_\_\_\_\_\_, which means that x is in the set of all real numbers.



**Y-intercept** is the place that the graph crosses the \_\_\_\_\_\_\_\_\_\_\_\_\_.



Likewise, we can solve for the **y-intercept** by reading it off the graph or plugging \_\_\_\_\_\_\_\_\_\_\_ into the expression and solving for y.



**Range** is the set of all possible \_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_ values.



**Degree** is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ exponent in the expression of a polynomial.

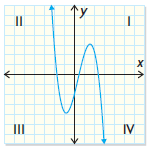
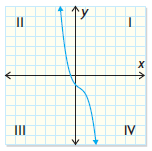


For example, f(x) = 3x3+2x2+ 6x -7 has degree \_\_\_\_\_.



**Turning point** is the point where the y-value changes from \_\_\_\_\_\_\_\_\_\_\_ 🡨🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_.



(a) (b) 



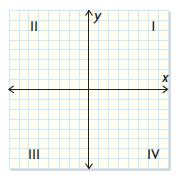
For example (a) has \_\_\_\_ turning points and (b) has \_\_\_\_\_ turning points.



**End behavior** is the description of which \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the end points of the graph are in.

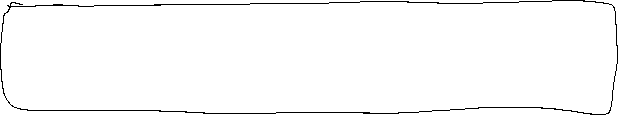


**Graph Quadrants**

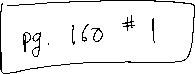




**Properties of Polynomial Functions**



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type |  |  |  |  |
| Degree, n |  |  |  |  |
| Sketch |  |  |  |  |
| Number of  x-intercepts |  |  |  |  |
| Number of  y-intercepts |  |  |  |  |
| End Behavior | Line extends from quadrant ll to quadrant l or from quadrant lll into quadrant lV | Line extends from quadrant lll to quadrant l or from quadrant ll into quadrant lV | Curve extends from quadrant ll to quadrant l or from quadrant lll into quadrant lV | Curve extends from quadrant lll to quadrant l or from quadrant ll into quadrant lV |
| Domain | {x | xR} | {x | xR} | {x | xR} | {x | xR} |
| Range | {y | y = constant, yR} | {y | yR} | {y | y maximum,  yR} or  {y | y minimum,  yR} | {y | yR} |
| Number of Turning Points |  |  |  |  |
| Example Expression | y = 5 | y = 2x+5 | y = 3x2\_ 2x+5 | y = x3 +3x2\_ 2x+5 |



**Example**

Determine the x-intercept(s), y-intercept, end behavior, domain, range and number of turning points for each of the following graphs.

a) y = x + 2

*x-intercept(s)*



*y-intercept*



*end behavior*



*domain*



*range*



*number of turning points*



b) y = (x-1)2 – 2



*x-intercept(s)*



*y-intercept*



*end behavior*



*domain*



*range*



*number of turning points*



**Assignment**: P. 383 #1-3