PENANG SANGAM HIGH SCHOOL
P.O.BOX 44, RAKIRAKI
LESSON NOTES

School: Penang Sangam High School **Year/Level:** 13 **Subject:** Mathematics

Strand	**3 FUNCTIONS**
Sub Strand	**3.2 Graphs of Functions**
Content Learning Outcome	The students should be able to; - draw graphs of polynomials - draw graphs of rational functions

Lesson Notes (7)

Good day to you all. We have already discussed about operations on functions and finding domain and range of combined functions. Next set of notes are given on functions: Polynomial functions.

3.2.1 Graphs of Polynomials

Lesson objectives:

The students should be able to:

- find x and y intercept.
- determine turning point, inflection and intercepts.
- sketch graph of polynomials.

Study the notes and examples with the given instructions and attempt the questions that follows

Notes:

- Polynomial graphs are smooth, unbroken curve with no sharp corners.
- To sketch;
  - find x and y intercepts.
  - determine intercepts, turning point and point of inflection.

For a factor $(x - a)^n$,
if n is odd then there is an inflection at $x = a$ and
if n is even there is a turning point at $x = a$.

  - sketch the graph

The degree of x in the expansion of the polynomial is odd, the end behavior of $f(x)$ will be similar to the graph of x^3.

$+x^3$ i.e. tails pointing opposite direction

$-x^3$ i.e.

The degree of x in the expansion of the polynomial is even, the end behavior of $f(x)$ will be similar to the graph of x^2.

$+x^2$ i.e.

$-x^2$ i.e.

Note: the test point method can also be used to determine whether the graph is above or below the x-axis.

Example 1:

Sketch the graph of $y = x(x-2)^2(1-x)^3$ clearly showing all intercepts, turning points and points of inflection.

Answer:

$x-$ int let $y = 0$ $\qquad$ $y-$ int (let $x = 0$)

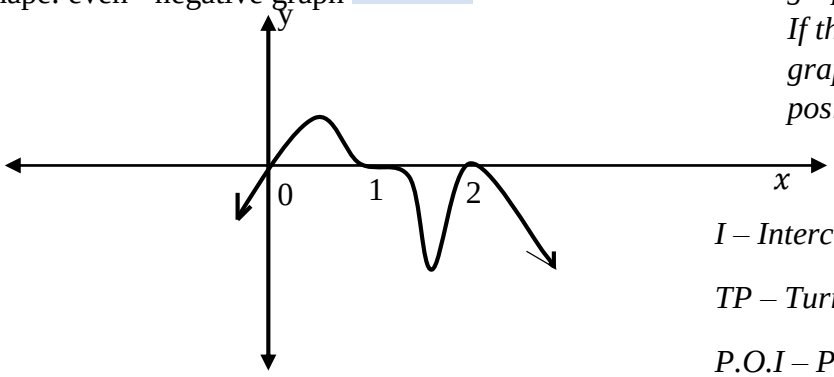
$0 = x(x-2)^2(1-x)^3$ $\qquad$ $y = 0(0-2)^2(1-0)^3$

$x = 0 \qquad (x-2)^2 = 0 \qquad (1-x)^3 = 0 \qquad y = 0 \quad (0,0)$

$x = 0$ (I) $\quad x = 2$ (TP) $\qquad 1 - x = 0$

$(0,0) \qquad (2,0) \qquad x = 1 \quad (1,0)$ (P.O.I)

Shape: even - negative graph



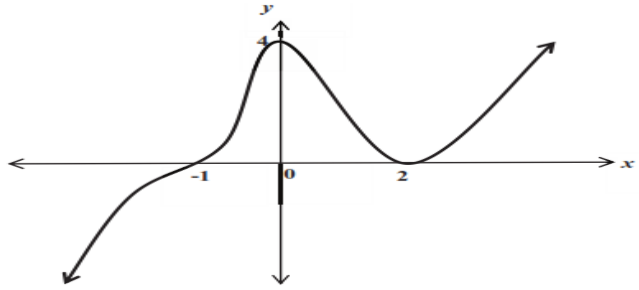
You can also use the test point method to determine whether the graph is above or below the x – axis. If the value for $f(x)$ is negative, the graph is below x-axis and if it is positive, it is above x- axis.

I – Intercept

TP – Turning point

P.O.I – Point of Inflection

Example 2: Write the equation of the polynomial shown.



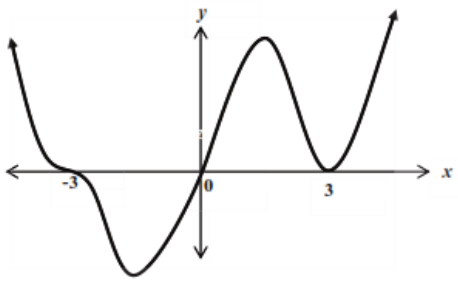
$x-$ Intercept: $x = -1, x = 2$
y- intercept = 4, inflection at $x = -1$, and turning point at $x = 2$

therefore, Answer:

$y = (x+1)^3(x-2)^2$

Exercise:

1. Write the equation of the polynomial shown.



2. Sketch the following graph by clearly showing all intercepts, turning points and point of inflection.

$y = x^3(x-2)^2(1-x)$

3. A polynomial function is given as $y = f(x)$, if $f(0) = f(2) = f(5) = 0$ *and* $f(3) = 24$

a) find x and y intercept

b) find the equation of the function

c) Sketch the graph of the function.