Lesson 2: Using Technology to Explore Polynomial Functions

GOALS:

- Use technology (the graphing calculator) to determine the characteristics of polynomial functions.

In this lesson, we will determine some of the characteristics of polynomials by using technology, a graphing calculator, to graph and explore polynomial functions.

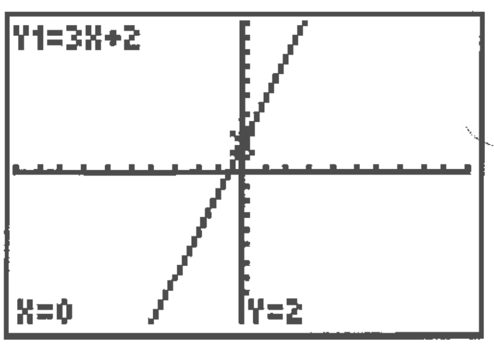
Example 1: Graphing a Linear Function

Using the graphing calculator, enter the equation $y = 3x + 2$ and study the graph.

The graph of a straight line is not that interesting but it does contain two key points, the y –intercept and the x –intercept. We will review how to determine the values of these using the calculator.

Determining the y – intercept:

The y –intercept is determined using 2nd, CALC menu and selecting the VALUE option to enter a value of 0 in for x after the prompt: $x = 0$. For the linear function $y = 3x + 2$ the y –intercept is 2. Note: the y –intercept is the same value as the constant term of the polynomial function. This will always be true.



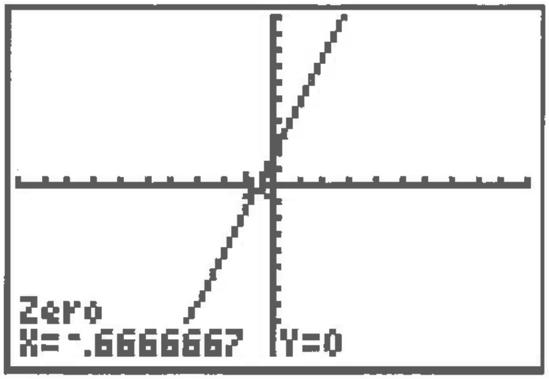
using graphing calculator.
• enter equation: $y = 3x + 2$
• To find y-intercept, press the following keys.

[2nd] [Trace] [Value]

end $x=0$, [ENTER] $y: 2$

Determining the x – intercept: also called: roots, zeros, solutions

The x –intercept is harder to determine. We still use the 2[nd], CALC menu but this time we choose the ZERO option. When using the ZERO command, we must set a left and right boundary. Your teacher will explain how to do this. For this line, the x –intercept is -0.67 (note the rounding off to two decimal places).



Complete the table for the equation $y = 3x + 2$

Degree	1 (exponent x^1)
Number of turning points	none
Value of y –intercept	2
Value of x –intercept(s)	-0.67
End Behaviour	Q. III to Q I
Domain	$\{x / x \in R\}$
Range	$\{y / y \in R\}$

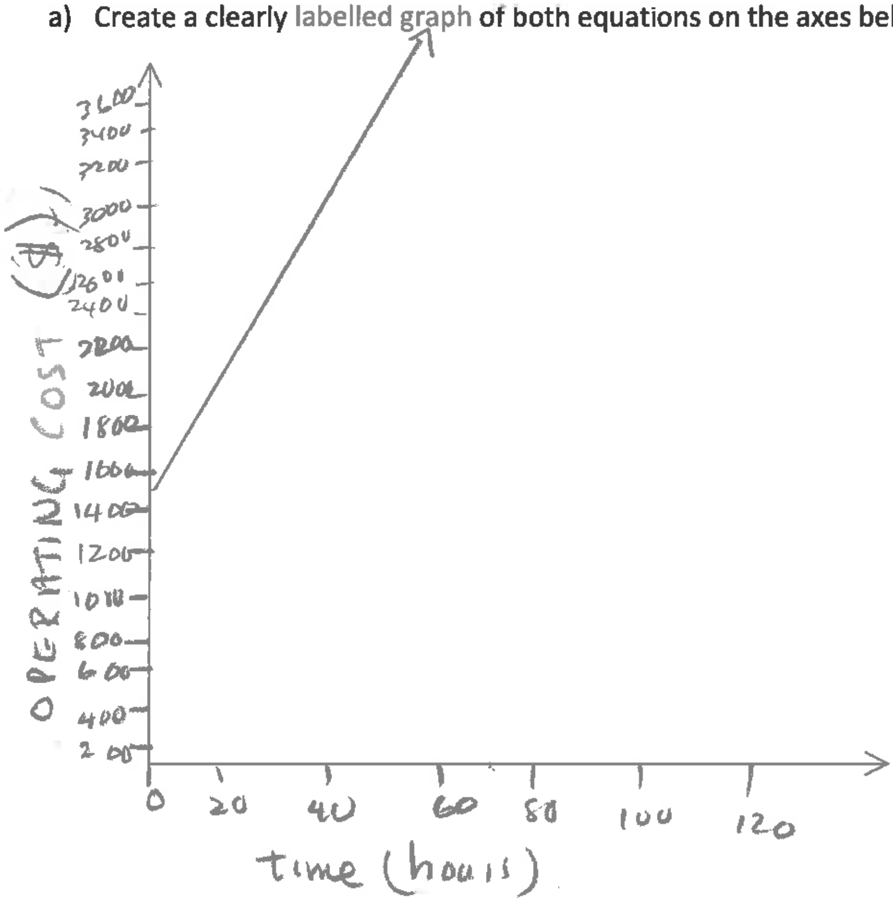
Example 2: Graphing a Quadratic Function

A store owner determines that his operating costs are modelled by the following equation:

$$y = 0.04x^2 + 44x + 1500$$

where x represents time, in hours, that the store is open per week and y represents the operating costs, in dollars.

a) Create a clearly labelled graph of both equations on the axes below.



b) Determine the cost of operating the store if the store is open 70 hours per week.

2nd TRACE VALUE ENTER x = 70 ENTER

4776

$4776

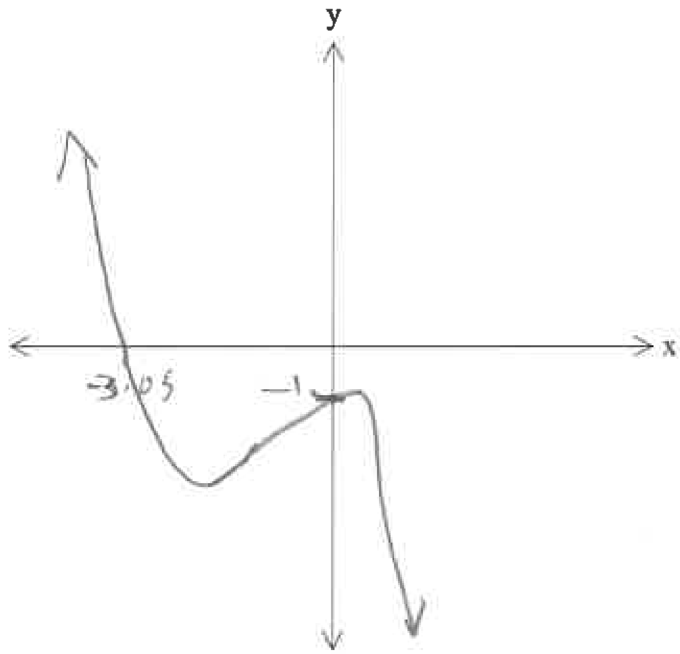
c) If the owner begins to make a profit after covering costs of $3200.00 how many hours per week must he be open to begin making a profit?

y = 3200

x = 37.37 hours

Example 3: Graphing a Cubic Function

Use a graphing calculator to graph the function: $y = -2x^3 - 5x^2 + 3x - 1$
Sketch the graph in the space provided.



Complete the table below.

Degree	3 (x^3)
Number of turning points	2
Value of the leading coefficient	−2
Value of y −intercept	−1
Value of x −intercept(s)	−3.65
End Behaviour	Q. II to Q IV
Domain	$\{x / x \in R\}$
Range	$\{y / y \in R\}$
Maximum Value	∞

$-2x^3$,