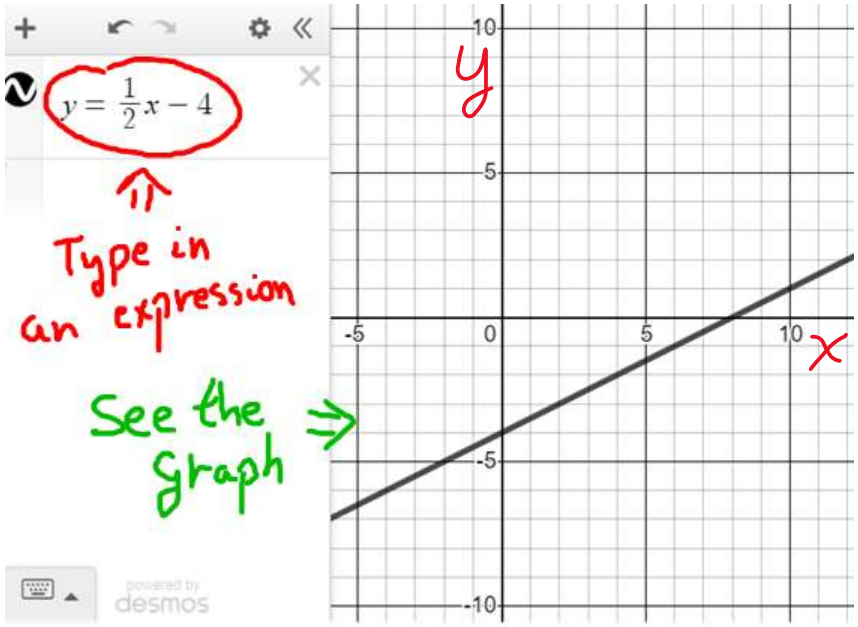
GRADE 12 APPLIED
UNIT C - FUNCTIONS

GUIDE TO DESMOS GRAPHING TOOL (Adapted)

This is an adapted guide to the **Desmos Graphing Tool**. A more complete Guide is available on the DESMOS help menu.

The DESMOS Graphing tool is available directly on-line in a browser [*www.desmos/calculator*] or as a download in both Android and Apple Device.

The DESMOS graphing tool can replace the TI-83 for most graphing purposes and the DESMOS is far more intuitive. The TI-83 is 25 years old! There are other rather similar graphing tools as well; **Geogebra**, for example. Of course, a piece of graph paper or a simple hand-drawn sketch will often suffice for some purposes too. In other words, there are a variety of ways to visualize mathematical relationships, DESMOS presently being the preferred interactive graphing method.



Enter an expression or function such as:

$$y = \frac{1}{2}x - 4$$

The graph of that line is instantly displayed.

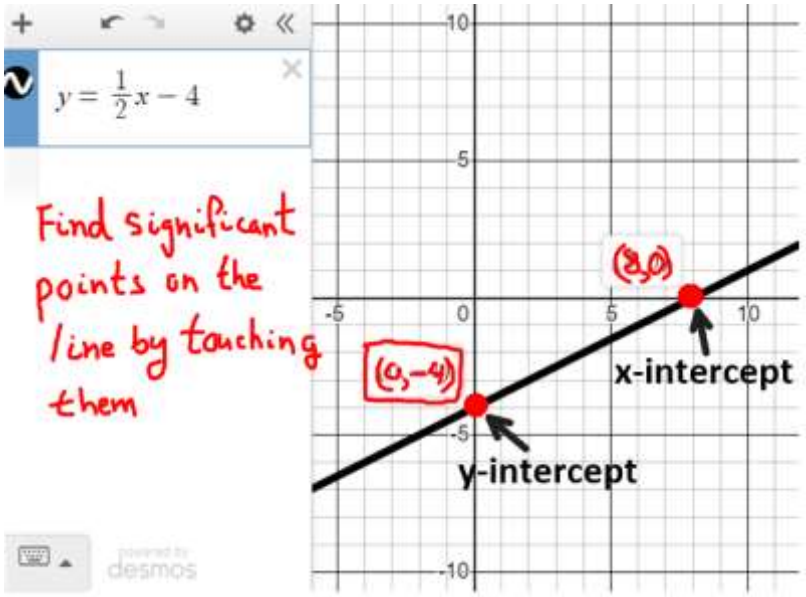
Of course, the x variable is the left ↔ right horizontal axis, the y variable the vertical axis.

You learned how to readily graph linear relationships (lines) on paper in Grade 11 or earlier.

Find Significant Points

Finding significant points; intercepts for example is easy! Just touch the screen (use mouse if not using a touch enabled device) to toggle on the point(s) of interest.

Knowing where you cross (ie*: intercept*) Main Street and where you intercept Portage Avenue are rather important points and will define your line.



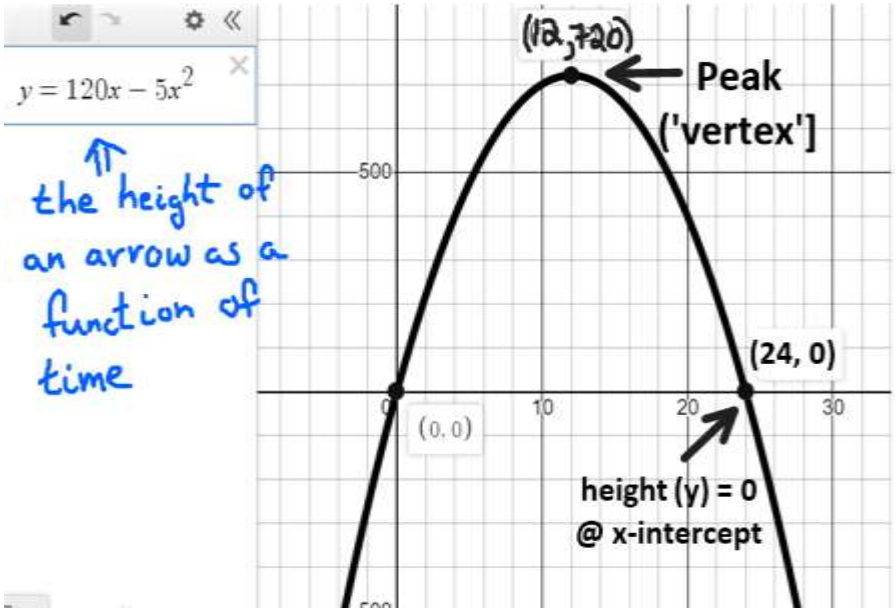
Typical Application. [Quadratic Equation]

The height of a particular arrow shot upwards is given by the function:

$$y = 120x - 5x^2;$$

Where x is the time in units of seconds [sec] and y is the height in units of metres [m]

a. determine the peak height the arrow reaches;
b. determine the time the arrow hits the ground.



Just touch! The arrow reaches a peak (vertex) height at 12 sec at a height of 720 m, the arrow hit the ground at 24 sec. [lol, obviously?]

SIZING THE GRAPH

You likely figured out that to squeeze the graph into a visible view you had to adjust the graph size. Simply pinching and stretching and centering the grid with your fingers will do the trick!

If you do not have a touch device your laptop can still adjust the graph size on the screen using the WRENCH selection;  . You can figure that feature out yourself, but you define the domain and range you want to graph.

Let's do two more applications!

Compound Interest example

Jeff invests **$3,500** in a bank account that pays **8%** interest **compounded monthly**.

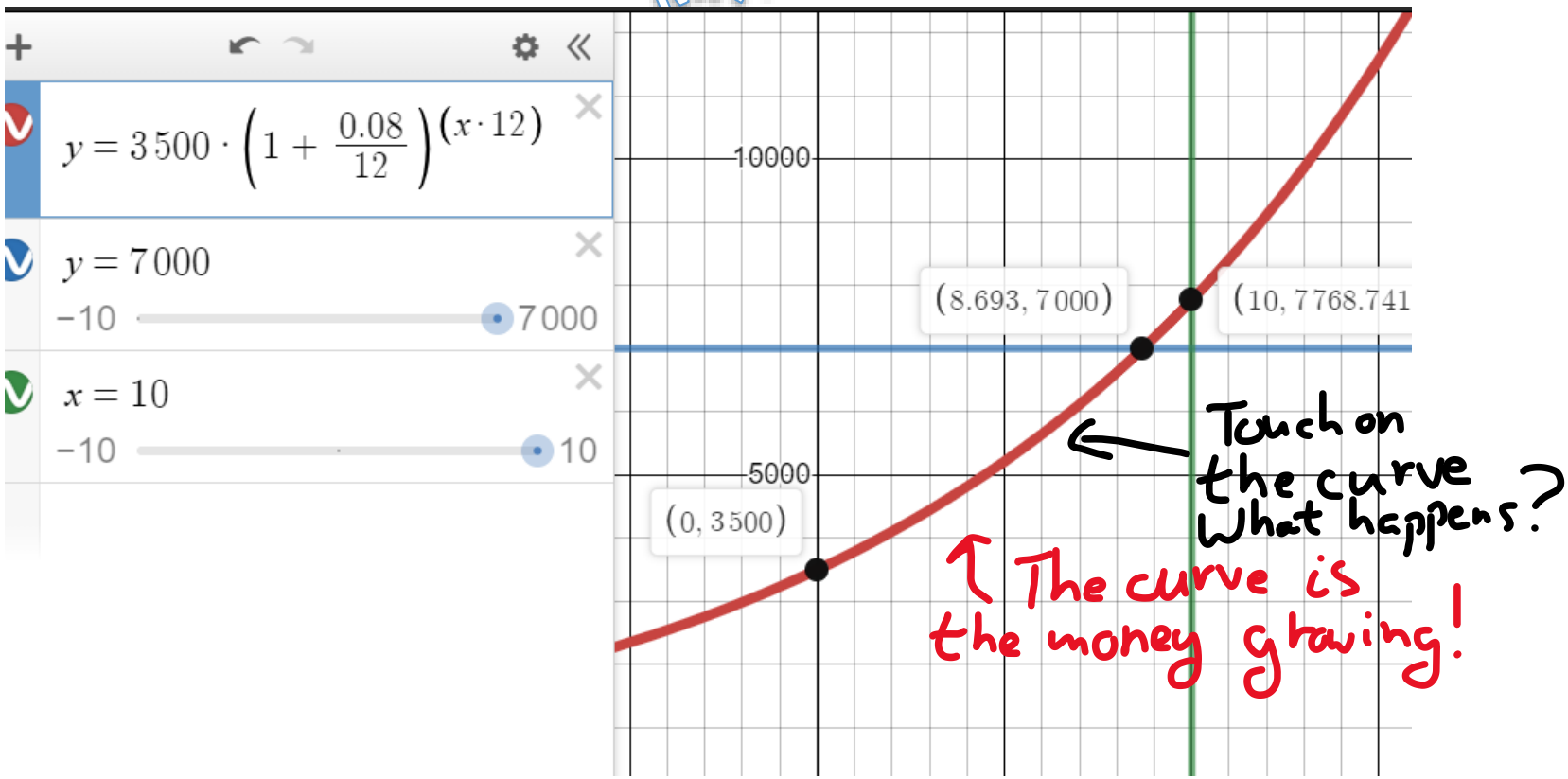
a. Determine the balance of Jeff's bank account after 10 years!

b. Determine the number of years it took for his investment to double to $7,000

You recall the Compound Interest formula, how money grows as a function of time:

$$A = P \cdot (1 + r/s)^{n \cdot s}$$

MrF


$y = 3500 \cdot \left(1 + \frac{0.08}{12}\right)^{(x \cdot 12)}$
$y = 7000$
−10
7000
$x = 10$
−10
10
10000
5000
(8.693, 7000)
(10, 7768.741
(0, 3500)
Touch on the curve What happens?
The curve is the money growing!

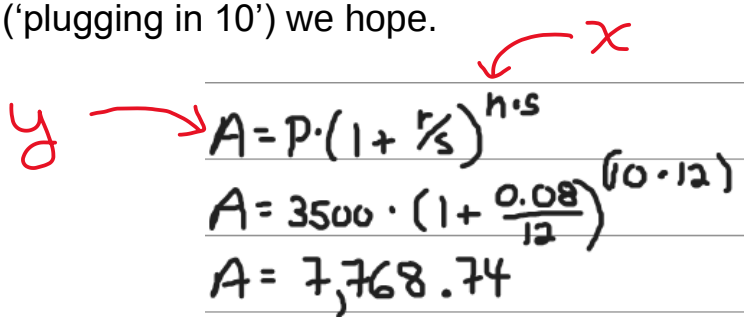
Enter the three functions:

The first function is the basic Compound Interest Formula from previous studies. It will take **lots** of pinching and stretching by you with your fingers on the screen to display the three functions.

The second equation, **y = 7000**, is a horizontal line where the money reaches $7,000, and you are interested in when your compounding investment ***intersects*** (crosses) at that $7,000. So, your money gets to $7,000 after a time of 8.693 years at the intersection. (which you sort of anticipated (?) from the 'Rule of 72')

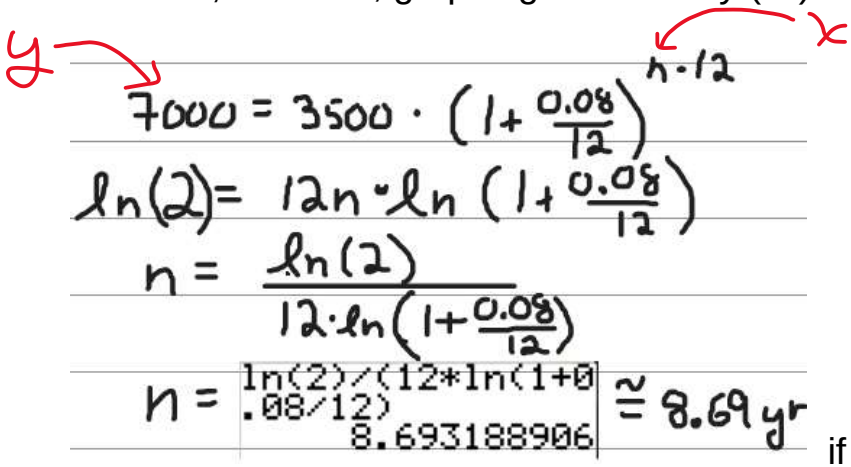
To find how much the $3500 investment is worth after exactly 10 years, see where the Compound Interest curve intersects at the Vertical Line: x = 10; thus, after exactly an x of 10 years the investment is worth $7,768.74

You are aware you could have done the above problem for the value of the investment at 10 years by just ***evaluating*** the function ('plugging in 10') we hope.



Of course, what we call '**n**' here is the '**x**' in the graph; graphing tools tend to favour just **x** and **y**.

To ***solve*** for the number of years to become a certain value of $7,000 is a little more complicated and would require Pre-Calculus Math; however, graphing is real easy (*lol*) to find the answer!



if you care.

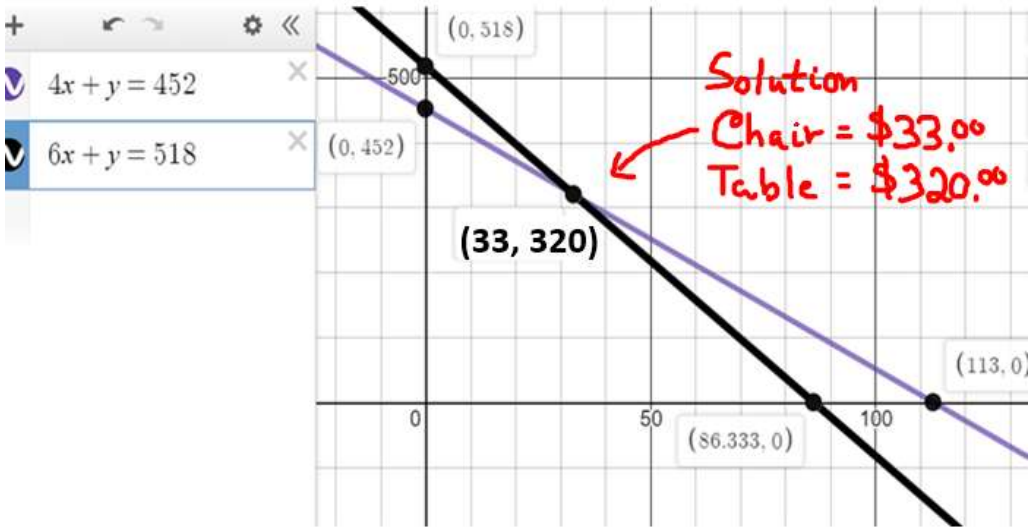
That was fun! Let us try one more!

This typical problem is called '*Simultaneous Linear Equations*", or "*Systems of Equations*".

> **Mike goes to the furniture store and buys four chairs and a table for $452; Katherine goes to the same furniture store and buys six of the same chairs as Mike and the same table and spends $518.**
>
> **Determine the price of a [single] chair and the price of a table.**

we need to solve for two things!! Why don't we call them x and y! Let x = the price of a chair; let y be the price of a table. (you could change it the other way around, would not change the solution!)

The Mike Equation: 4*x + 1y = 452
The Katherine Equation: 6x + y = 518



There, just that easy!

We entered the two equations.
(they are 'implicit' since both the x and y are on the same side of the equation, the TI-83 cannot do implicit like that)

Where Mike's statement equalled Katherine's statement is the solution; A chair costs $33 and a table costs $320.

Of course you will check!

Let's check our solution as always! You always check your solution don't you? That is why you do not need an answer key to do algebra!

Does 4*(33) + 320 = 452? YES!

Does 6 * (33) + 320 = 518?? YES Ma'am!

We are awesome! It is just that easy.

But you do know, had you taken or recalled Grade 10 Applied, that you could have figured it out with some basic algebra!

$$6x + y = 518$$
$$-(4x + y = 452)$$
$$2x = 66$$
$$\therefore x = 33 \quad \text{Chair}$$
$$\text{so } 6(33) + y = 518$$
$$y = 518 - 6(33)$$
$$y = 320 \quad \text{Table}$$

lol, if you care!

But if you are good at graphing you can forget the Algebra!!! (mostly).

If you followed all this materiel about graphing you pretty much almost aced the key lessons of Unit C Functions!

More instructions on how to use the DESMOS (or any graphing tool really) to follow.

Enjoy.