GRADE 12 APPLIED
UNIT C – SOLVE QUADRATIC WORKSHEET
(*Grade 11 Applied Review*)

Name: _____

Introduction. We have a huge variety of graphing tools. The 'go-to' one we still use is the TI-83 Graphing Calculator (despite that that technology is 30 years old). Your phone/device does an even better job using the Desmos graphing.

Solve the following using the TI-83 Graphing Tool first. Then try a couple other Graphing Apps on your device or the class device(s) that are your favourite.

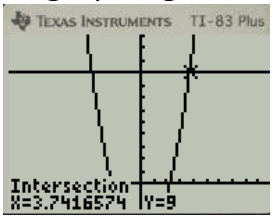
You may also want to see if you could have had a reasonable guess at the answer(s) (like always) even at the very start for the simpler equations.

Further, you may want to investigate with the teacher, if you are very curious, how you would solve the question without graphing (just using *algebra*) despite that you are ***always allowed*** to use a graphing tool in Applied Math.

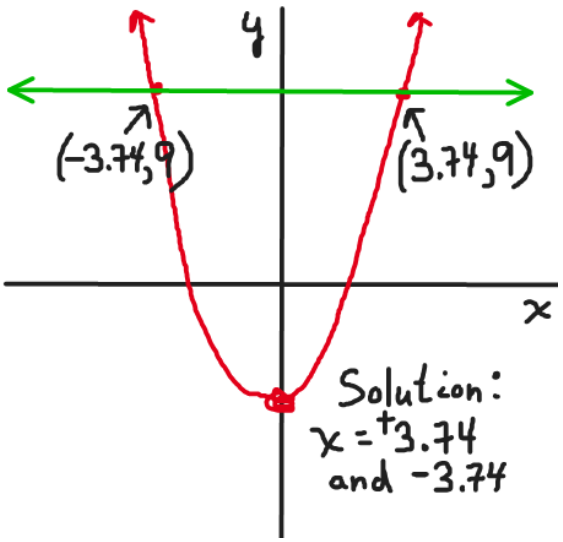
Instructions. For each of the questions below sketch the function(s) [equations] and solutions using a graphing tool.
And maybe recall that the 'square of a negative amount is positive'.

1. **Example**: State when the function **$f(x) = x^2 - 5$** has a value of **9** and sketch and label the solution(s).
ie: solve for **x**: **$9 = x^2 - 5$**

My guess was:
more than 3 but less than 4
$3 < x < 4$. There is a 'twin' on the other side too.
Then I use a graphing too!



and sketch and label solution(s)

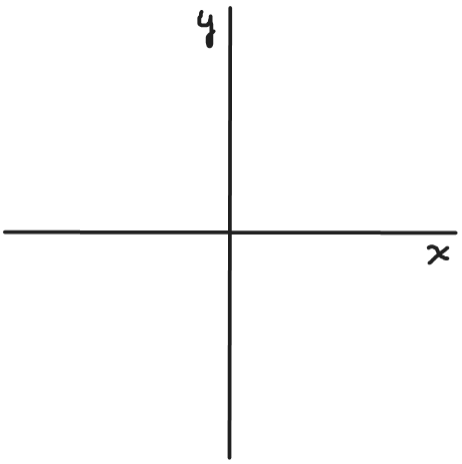


Ohh! There was two answers for the x!

2. Solve for x:

$$2x^2 - 10 = 5$$

Sketch the function(s) and clearly label the solution(s).



Did you have a rough guess first?

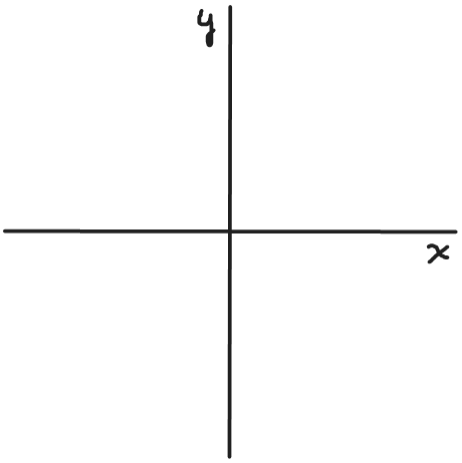
____

Try solving with Algebra!?

3. Solve for x:

$$0.5x^2 - 3x = 8$$

Sketch the function(s) and clearly label the solution(s).

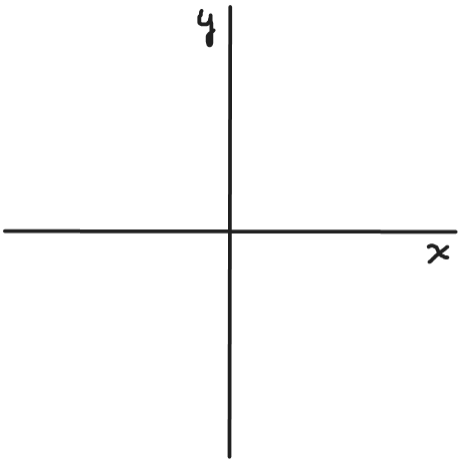


Doing this with Algebra would be a challenge, but it is a Grade 10 Applied unit.

4. Solve for x:

$$-x^2 - 3x + 18 = 12$$

Sketch the function(s) and clearly label the solution(s).



Try rough guess(es) first? ____

Look for a twin sister??

5. Solve for x in this 'factored form' of a quadratic:

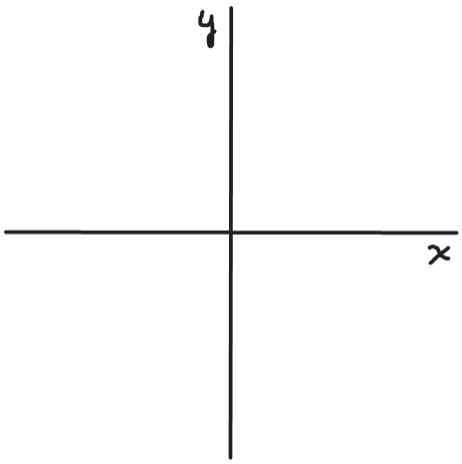
$$-5 = -2 * (x + 7) * (x - 3)$$

Sketch the function(s) and clearly label the solution(s).

State the 'window' you used on your graphing tool:

X_{min}: _____ X_{max}: _____

Y_{min}: _____ Y_{max}: _____



6. You likely noticed that when you throw a ball, the height can be calculated by how long it is in the air. The equation for finding the height, **h**, of a baseball [on earth] that is thrown with a vertical speed of 25 metres per second by a person 2 metres tall is given by:

$$h = -4.9t^2 + 25t + 2$$

where the height, h, is in units of metres and the time , t, is in units of seconds. (of course most graphing tools only have *y* and *x*, not 'h' and 't')

(don't worry about this physics formula! This is not a physics course)

Sketch and neatly label on one diagram the following:

a. The time when the ball reaches its peak height (ie: vertex time)
b. The maximum height the ball achieves (ie: vertex height)
c. The time(s) at which the ball has a height of 20 metres.
d. The time(s) at which the ball has a height of 10 metres.
e. The time(s) at which the ball has a height of 40 metres.
f. The time it takes to hit the ground (ie: a 'zero', when the height = 0)

Sketch and label the situations and solutions below:

Curious? What is $-25 / (2*-4.9)$?

7. You sell homemade bannock. A friend who is studying economics and business has told you a formula for the weekly profit you can expect depending on the price you charge per bannock.

> If you charge too little for a bannock you have lots of sales; however, lots of sales for a little amount of money per bannock is not very much profit.
>
> If you charge too much you have very few sales, and very few sales of a over-priced bannock is not very much profit either.
>
> There has to be a sweet spot that you sell a bannock for that gives you the optimum profit.

The formula to calculate how profit relates to the price of a bannock is:

$$\textbf{Profit} = -20*(\text{price of a bannock})^2 + 140*(\text{price of a bannock})$$

$$y = -20x^2 + 140x \ ;$$

where **y** is the weekly profit in units of **$** and **x** is the price you charge per bannock in units of **$/bannock**.

> a. Calculate the optimum price per bannock to charge to maximize your profit!
> b. Determine how much you should charge if you want to earn exactly $180 per week.
> c. Determine how much you should charge if you want to make at least $180 per week [ie: profit ≥ $180 per week.]

Lots of room for sketches and stuff here ↓

?Curious? What is ¯140/[2*(¯20)] ?