H
~~P~~OLYNOMIALS

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Student Worksheet

7 8 9 **10 11** 12

TI-Nspire™ Investigation Student 50 min

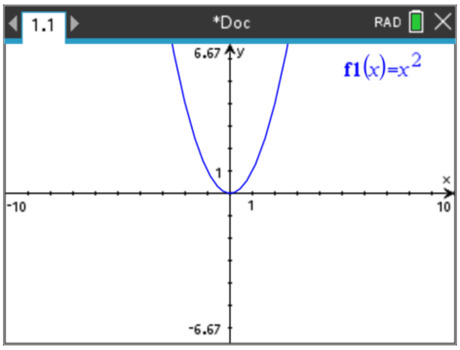
The association of holly with the festive season dates back many centuries. Druids, Celtics, and Romans believed holly had magical properties, they would bring the holly into their homes during winter and wear it in wreaths to ensure the return of spring.

Holly + Polynomials = Holynomials

Start a new document and insert a Graphs Application.

Graph the function: $y = x^2$

This graph needs to be duplicated, translated, dilated reflected and restricted to produce a holly leaf!

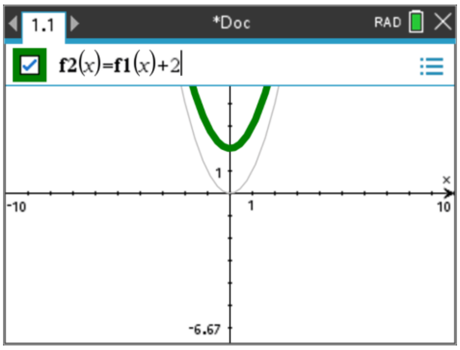


The first transformation is in the positive y direction. The choice is yours with regards to the size of the translation, some experimentation may be needed in order to produce the best holly leaf.

Graph translation: $f_2(x) = f_1(x) + 2$ [Sample only]

Change the graph **colour** to green and **attributes** to a 'thick' line, this can be achieved by pressing: ctrl + menu while the mouse is over the graph.

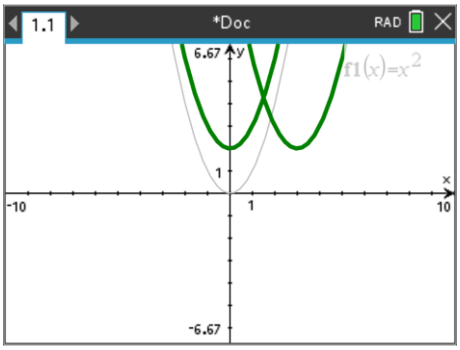
Note: The original graph has been changed to light grey.



The next graph is horizontal translation of the second, again, the choice is yours with regards to size.

Graph translation: $f_3(x) = f_2(x-3)$ [Sample only]

Once again, the colour has been changed to green and the line made thicker.

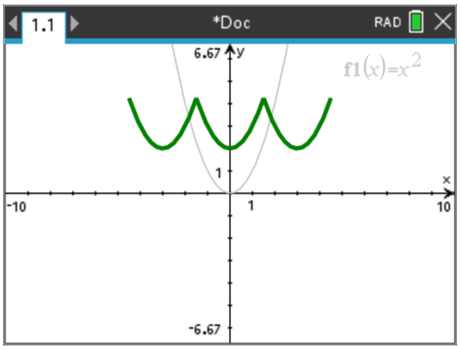


Authors: Renee & Peter Fox

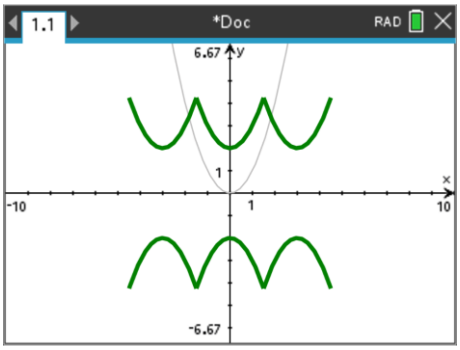
The next task is to restrict the domain of $f_2(x)$ and $f_3(x)$ so that the graphs do not extend beyond the holly leaf.

To do this you will need to determine where the graphs intersect, then apply the corresponding domain restrictions.

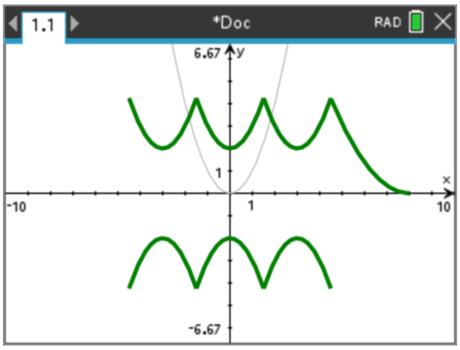
Another portion of the leaf has been included (opposite). This other portion can be achieved using either a reflection or a translation.



The other side of the holly leaf can be created by applying appropriate reflections.



A dilation and translation are required to complete the top of the holly leaf.

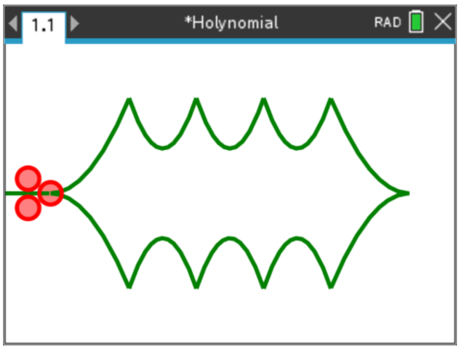


The basic holly leaf design has been completed!

One of the things that distinguishes holly from mistletoe is the bright red berries, so these have been added to complete the design. (Circle equations)

The berries have been coloured using an appropriate inequality sign for their equation. It must be noted that the berries are decorative and not an actual part of the 'holynomial'.

The axes have been hidden, so too the original degree two polynomial (quadratic), just to make the design clearer.



There are numerous ways you can improve on this very simplistic design.

Examples: A traditional holly leaf tapers towards the tip and has a more rounded overall shape rather than the long uniform shape of our proto-type; furthermore, the curves are not as dramatic. Now you have the basic skills, create your best holynomial.

Authors: Renee & Peter Fox