Area of Study 1

Functions & Graphs

Graphs of power functions, $f(x) = x^n$ for $n \in N$ and $n = -1, -2, \frac{1}{2}, \frac{1}{3}$, including transformations of these to the form $y = a(x + b)^n + c$ where $a, b, c \in R$ and $a \neq 0$.

Functions and function notation, specifying a function, evaluation of $f(x)$ where $x \in R$.

Domain, including maximal (implied or natural) domain, range and codomain.

Representation by rule, graph or table, including examples of real life data not modelled by rule, such as water storage levels or exchange rates.

Use of vertical line test including examples of relations that are not functions, including vertical lines, $y^2 = x$ and circles.

Graphs of inverse functions.

Use of parameters to represent families of functions, determination of the rule of a particular function. Applications and modelling with power functions.

Review of linear functions and coordinate geometry, midpoint of a line segment, distance between two points.

Equation of a straight line, gradient and intercepts, graphs of linear functions, applications and modelling with linear functions. Horizontal and vertical lines, parallel and perpendicular lines.

Solving simultaneous equations with two unknowns, geometric interpretation.

Possible assessment: a variation of the *Line segment graphs* learning activity or a short test comprising a collection of multiple-choice and short answer questions.

Expanding and factorising quadratic expressions with integer coefficients. Rational root theorem applied to quadratic functions.

Expressing $ax^2 + bx + c$, where $a,b,c \in Z$ and $a \neq 0$ in completed square form.

The quadratic formula and discriminant. Null factor law and solving quadratic equations, including simple cases of the numerical method of bisection.

Sample learning activity: *Are there rational roots?* (.doc)

Graphing quadratic functions, domain, range and codomain, key features and effects of transformations on the graphs of quadratic functions.
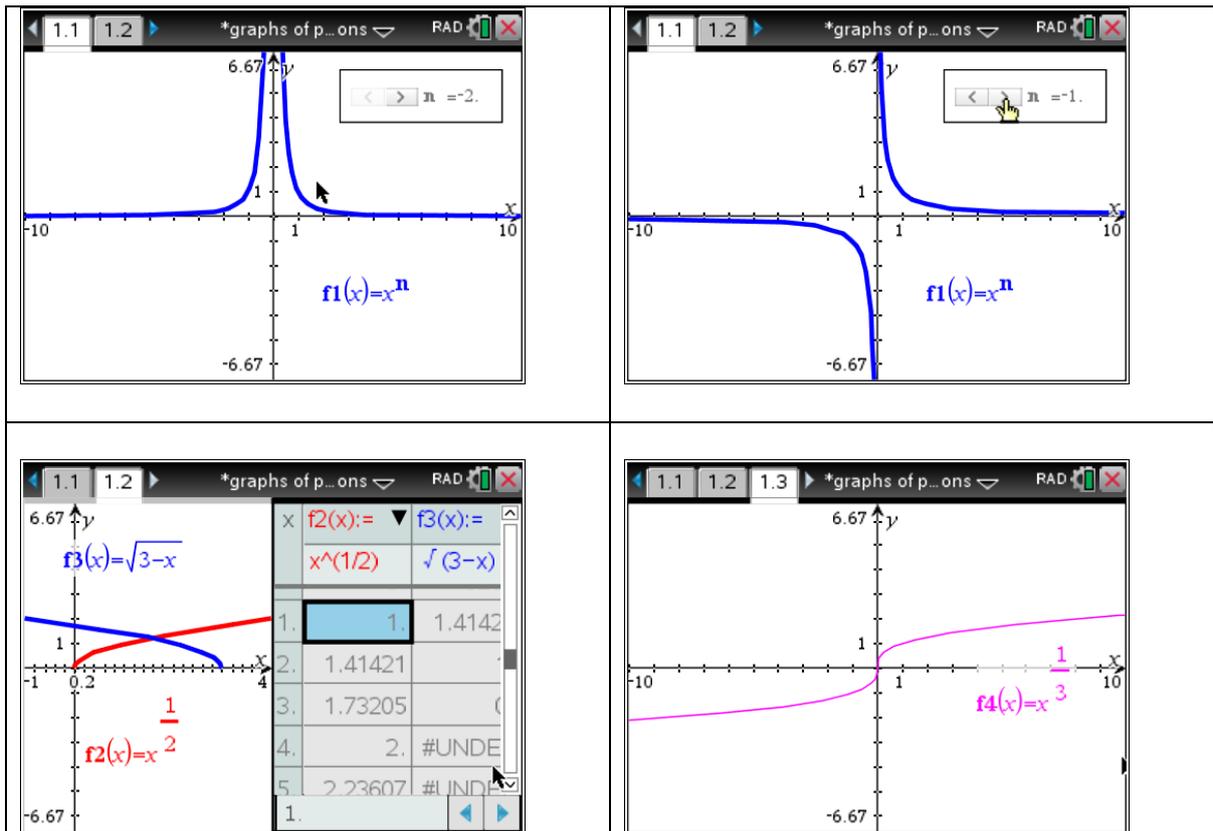
Applications and modelling with quadratic functions

Simultaneous equations.

LESSON ONE

How do powers alter the picture?

Investigating graphs of hyperbolas, truncus, square root graph and $y = x^{\frac{1}{3}}$.

Concepts of domain and range for each graph.

Rectangular hyperbolas: main features, asymptotes, use Graph Trace. Axes intercepts on the calculator and algebraically. Transformations.