Real Function

- **The Vertical Line test**
  If a vertical line cuts a graph only once anyway along the graph, then the graph is a function

- **Even and odd functions**
  - For even functions, $f(x) = f(-x)$ with symmetry about the y-axis
  - For odd functions, $f(x) = -f(x)$ with point symmetry about the origin

- **Domain and range**
  - The domain is the spread of the x values over a graph
  - The range is the spread of y values over a graph

- **Equations of basic functions**
  - Straight line: $ax + by + c = 0$ or $y = mx + b$
  - Parabola $y = ax^2 + by + c$

- **The Circle**
  The equation of circle with radius 'r' units and centre:
  - the origin is: $x^2 + y^2 = r^2$
  - (h, k) is: $(x - h)^2 + (y - k)^2 = r^2$
  - the general form is $x^2 + y^2 + ax + by + c = 0$

- **The Semicircle**
  - An upper semi circle has equation $y = \sqrt{r^2 - x^2}$
  - A lower semi circle has equation $y = -\sqrt{r^2 - x^2}$

- **The Exponential function**
  - are of the form $y = a^x$
  - all pass through the point (0, 1)
  - when the index is positive the curve is increasing for all values of x
  - when the index is negative the curve is decreasing for all values of x
  - the x-axis is an asymptote

- **The Hyperbola**
  - are of the form $y = \frac{a}{x}$ or $xy = a$
  - the x and y axes are asymptotes
  - when $a > 0$ the curve is decreasing for all x
  - when $a < 0$ the curve is increasing for all x
  - there is a discontinuity at $x = 0$