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**Exercise 3.2** For each expression, provide two levels of description:

1.    i An identity.  
      ii An arithmetical identity, expressing a cube as the sum of three cubes.
2.    i An arithmetical expression.  
      ii A quadratic surd, with same radicands.
3.    i A chain of inequalities.  
      ii Upper and lower rational bounds for the square root of 2.
4.    i An algebraic expression.  
      ii An algebraic expression consisting of three monomials.
5.    i An inequality.  
      ii An algebraic inequality in two unknowns.
6.    i An identity.  
      ii An algebraic formula for the expansion of the cube of an expression.
7.    i An equality.  
      ii The cartesian equation of a parabola passing through the origin.
8.    i An equation.  
      ii An equation which has no answers. (The solution set is empty.)
9.    i An identity.  
      ii The trigonometric formula for the sine of the difference of two angles.
10.   i An equation  
      ii A differential equation, with the underlying ambient set of differentiable functions.
11.   i An inequality.  
      ii An inequality with multivariate functions on each side.
12.   i A system of equations.  
      ii A system of two simultaneous equations in 2 unknowns.
13.   i An identity.  
      ii An identity, expressing associative law on sets.
14.   i An identity.  
      ii A formula for the infinite summation of reciprocal of the fourth power of natural numbers.

**Exercise 3.4**

1.    i A function.  
      ii The real function that adds 1 to its argument.

2.    i A function.  
      ii The integral of a rational function.
3.    i An identity. (A functional identity.)  
      ii The formula for the derivative of the product of two functions.
4.    i An identity. (A functional identity.)  
      ii The formula for integral of a function with substituted unknown.
5.    i An integral.  
      ii The indefinite integral of a function of two variables, performed with respect to the first variable.
6.    i An integral.  
      ii The indefinite double integral of a function, performed with respect to the xy plane.
7.    i An identity. (A definition.)  
      ii The power series of the cosine.
8.    i A derivative.  
      ii The sum of partial derivatives of a multivariate function.
9.    i A finite product of functions.  
      ii The product of all the partial derivatives of a function of several variables.
10.   i An infinite summation.  
      ii Infinite summation of an unknown raised to square numbers.
11.   i An integral  
      ii The infinite integral of a function containing napier's constant.
12.   i An infinite product  
      ii The infinite product of a function divided by square numbers.

### Exercise 3.5

1.    i A Set.  
      ii The intersection of the inverse images of the elements of a sequence of sets.
2.    i A Number.  
      ii The size of the infinite union of a sequence of power sets.
3.    i A Set equation.  
      ii The set equation expressing the union of sets over a function equals union of each individual set over the function.
4.    i A Set.  
      ii The set is cartesian product of n copies of irrational multiples of integer set.
5.    i A Set.  
      ii The set of all infinite sequences of the set of non-negative and less than 2 powers of x.

6.
  - i A Set.
  - ii The set of doubly-infinite sequences of elements of  $\mathbb{Z}$ .
7.
  - i An Equation.
  - ii A set equation with an empty solution set.
8.
  - i An Equation.
  - ii The set of functions which multiply previous argument and its value in function as the result.
9.
  - i An Equation
  - ii A functional equation where composition of the function for  $n$  times results the identity function.
10.
  - i A Set.
  - ii The Minkowski sum of an interval for  $n$  times. (The closed interval of  $[0, n]$ .)