

NCEA Level 2 Mathematics (Homework)

4. Functions

Reading

Go and watch...

<https://www.youtube.com/watch?v=PtLnwvH4kuE>

What's it good for?

People use functions and mathematical modelling for...

- Statistics, engineering, and the sciences: extrapolation from a set of data and prediction of results from future experiments and other situations is a key part of the scientific method.
- Theoretical physics: in particular, the mathematics behind quantum mechanics is heavily dependent on linear transformations, a particular class of function.
- Mathematics: as I mentioned in the notes, functions are a key idea in mathematics because they allow us to describe things like curves in space, rates of change, and relationships between objects. Graphs and diagrams of functions are often another way to view a concept and let us gain more clarity. Normally, we don't talk about functions in general, but restrict ourselves to subclasses of functions with nice properties (preserving distance, or more generally 'closeness'; preserving algebraic properties like addition or multiplication; etc.).

Questions

[This is from a sample Ministry of Education L2 assessment task for this standard.]

Place cones at the following co-ordinates, in metres, with the positive y axis pointing due north:

| Cone | Location | Cone | Location | Cone | Location |
|----------|----------|----------|----------|----------|----------|
| <i>A</i> | (-14, 1) | <i>D</i> | (7, 6) | <i>G</i> | (7, 0) |
| <i>B</i> | (-16, 6) | <i>E</i> | (7, 10) | <i>H</i> | (17, -3) |
| <i>C</i> | (3, 6) | <i>F</i> | (10, 10) | <i>I</i> | (7, 1) |

Give equations for each of the following curves:

1. Start from a point one metre to the north of cone *A*. Ride in a straight line to a point two metres to the north of cone *B*.
2. Starting from the end of line 1, weave around cones *B*, *C*, and *D*, such that the maximum distance south of cone *C* is the same as the maximum distance north of cones *B* and *D*, passing through the point (5, 6) following a curve of the form $f(x) = A \sin(x - 5) + C$.

As revision from L1, expand and simplify the following:

1. $(x - 2)^2(x + 8)$
2. $(5x - 4)(x + 2)(x + 1)$