NCEA Level 3 Trigonometry (exercise set)
8. Periodic Models

Goal To study the geometry of the graphs of trigonometric functions.

In this section we completed our goal of fully describing the geometry of the graph of $y = A\sin(\omega t - \phi) + y_0$. Since the graph of cosine is just a shifted sine graph, we know all about cosine graphs as well. We also know quite a bit about the graph of the tangent function.

In physics, when studying more complicated systems, one often finds that the motion of some object is a *sum* of sine and cosine functions, combined with an exponential. One example is a mass vibrating back and forwards in the presence of some kind of friction force.

Question Systematically study and describe the graph of $y = e^{-kt}\left(A\sin(\omega t - \phi) + B\cos(\nu t - \psi)\right)$.

Hints

- Periodic?
- Maxima and minima?
- Zeroes?
- Average value?
- Behaviour 'at infinity'?

Additional reading Hobson chapter VI.