# **STEP/Differentiation: Exercises - Overview** (15/6/23)

fmng.uk

If  $f(x) = x^2$ , what is f'(3x)?

### Q2

Q1

Find  $\frac{d}{dx}(a^x)$ 

## Q3

Show that  $\frac{d}{dx}(x^x) = x^x(1 + lnx)$ 

#### Q4

Find  $\frac{d}{dx}(x^{sinx})$ 

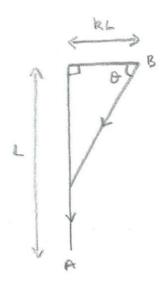
#### Q5

Find  $\frac{d}{dx} \log_a x$ 

#### Q6

Find the turning points of  $y = (x^2 - 4x + 3)^2$ , and hence sketch the curve.

A dog is being taken for a walk on a path round the edge of a ploughed field. The owner starts at *A* (see diagram), and walks it a distance *L* along one side of the field, and then (after turning a right angle) a distance *kL* along the next side. At *B*, the dog is let off the lead, but decides to run back to *A*, along the route indicated by arrows on the diagram (ie a stretch of ploughed field, followed by a stretch of path). If the dog's speed is reduced by  $\lambda$ % when running on the ploughed field, compared with the path, find an expression for the angle  $\theta$  that minimises the time taken for it to return to *A*.



Q7