

# Mathematics 1101Y – Calculus I: Functions and calculus of one variable

TRENT UNIVERSITY, 2013–2014

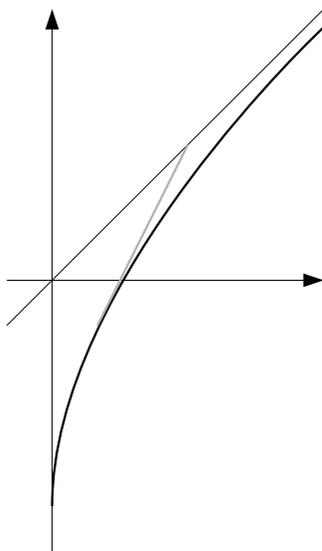
## Assignment #3

### The chase is on!

Due on Monday, 2 December, 2013.

For this assignment you will need to learn how to represent derivatives and to solve equations involving them in **Maple**. (In the worksheet environment, this means learning about the `diff` operator and the `dsolve` command, at a minimum.)

Max is walking Beau in the Cartesian plane, with the leash between them at its full 10 cubit extension.\* They walk up the negative  $x$ -axis, but just as Beau reaches the origin he spots a squirrel and starts running along the line  $y = x$  (in the positive direction), dragging Max behind him. The leash stays at full extension throughout and at any given instant is tangent to the curve Max is dragged along.



1. If  $(x, y)$  is a point on the curve Max is dragged along, find  $\frac{dy}{dx}$  as a function of  $x$ . [4]  
*Hint:* If Beau is at  $(u, u)$  when Max is at  $(x, y)$ , then the slope of the line joining them and the distance between them, respectively, are?
2. If  $(x, y)$  is a point on the curve Max is dragged along, use **Maple** and the equation you obtained in answering **1** to obtain  $y$  as a function of  $x$ . [5]
3. Where is Max when Beau is at  $(6, 6)$ ? [1]

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\* Max is a child and Beau is his dog. Beau is about twice Max's weight. They don't really live in the Cartesian plane. Cubits were unit of length based on the length of the forearm from the elbow to the tip of the middle finger; cubits – of various lengths! – were commonly used in ancient times in the “Fertile Crescent” running from Mesopotamia at one end to Egypt at the other, inclusive, and adjacent regions.