**Assignment #3**
**Solving Differential Equations**
*Due on Friday, 26 February.*

**Submission:** Scanned or photographed solutions are fine, so long as they are legible. Please try to make sure that they are oriented correctly – if they are sideways or upside down, they're rather harder to mark! Submission as a single pdf is strongly preferred, but other common formats are probably OK in a pinch. Also, please do not submit a file in one of `Maple`'s (or comparable program's) native format, though a printout of one to pdf would be more than acceptable. Please submit your solutions via Blackboard's Assignments module. If Blackboard does not acknowledge a successful upload, please try again. As a *last* resort, email your solutions to the instructor at: `sbilaniuk@trentu.ca`

Imagine the the Cartesian plane is a flat ice sheet. A sled – which somehow occupies a single point – sits at 5 on the $x$-axis, with a taut tether attached to a sled dog – which also somehow occupies a single point – at the origin. The dog begins to run straight down the $y$-axis, pulling on the tether and thus moving the sled. At any given instant, the sled is moving directly towards the dog but, since the tether remains taut and does not stretch, is always 5 units of distance away from the dog.

1. Use the geometry of the situation to set up an equation involving $x$, $y$, and $\dfrac{dy}{dx}$ which must be satisfied by $y = f(x)$, where the graph of $y = f(x)$ is the boat's path. *[6]*

*Note:* Obviously, we must have $f(5) = 0$. Also, the fact that the sled is always moving directly towards the dog means that the tether is part of the tangent line to the curve $y = f(x)$ at any given instant. The slope of a tangent line is given by – but I must not write too much here … :-)

2. Use `Maple` or a comparable program to solve this differential equation for $y = f(x)$, with the condition that $f(5) = 0$. *[4]*

*Note:* If using `Maple`'s worksheet mode, you will want to look up the $\widehat{\text{diff}}$ operator and the `dsolve` command.