**Problem Set 9**

Due in tutorial on Thursday, 11 December 2014

1. The function

$$f(x) \quad = \quad x + 3x^2$$

   is rotated around the interval $[-1, 1]$ to obtain a solid of revolution. Calculate its volume.

2. The region under the curve $f(x) = \cosh(x)$ between $x = 0$ and $x = a$ (where $a$ is a positive number) is rotated around the $x$-axis to give a solid of revolution. Calculate its volume. (You may find the identity

$$(\cosh(x))^2 \quad = \quad \frac{1}{2} + \frac{1}{2}\cosh(2x)$$

   useful.)

3. Now we rotate the curve $f(x) = \cosh(x)$ between $x = 0$ and $x = a$ around the $x$-axis to get a surface of revolution. Calculate its area. (Remember that $(\cosh(x))^2 - (\sinh(x))^2 = 1$.)

4. Now calculate the length of the curve $f(x) = \cosh(x)$ between $x = 0$ and $x = a$.