**Maths 104:103 2017W.**

**Fourth Written Assignment.**

*For Wednesday, October 25th, 2017 until 17:00hrs.*

**Note.** You have Wednesday until 5p.m. or so to hand-in this assignment.

**Comment for the student.** The purpose of the assignment is for you to practice how to write mathematics and no so much on the content of the course. Write the assignment as if you were explaining it for one of your schoolmates. Correctness of ideas and explanations are going to receive more marks than the actual result itself. Use lay language (or common use language) and do not make an essay out of this. This exercise should fit perfectly in one page. *An assignment where no explanation is provided of what is going on shall receive a mark of zero, even if you draw, wrote formulae or equations that make sense.*

**Exercise (4.1)** At a bank, interest is compounded continuously. The interest rate rises, however, and is given at time \( t \) years by the formula \( r(t) = 0.08 + (0.015)\sqrt{t} \). In particular, the interest rate now (that is, when \( t = 0 \)) is 0.08 (that is, 8%) while the interest rate a year from now (that is, when \( t = 1 \)) will be 0.095. If a person deposits $1,000 in an account now and leaves it alone, then the amount of money \( f(t) \) in the account at time \( t \) satisfies the LODE

\[
 f'(t) = r(t)f(t) = \left( 0.08 + 0.095\sqrt{t} \right) f(t), \quad t > 0,
\]

with the condition that \( f(0) = 1000 \). Observe that this LODE cannot be solved as presented in class, and the reason for that is that now \( r \) is a function, so the fundamental solution will not work as is, it need a slight modification.

1. Find the function \( f \) such that \( f(t) > 0 \) for all \( t > 0 \) and \( f(t) \) is the amount of money at time \( t \) years.

2. How much money will the person have in the account after 2 years?, and 5 years?

**Hint:** differentiate \( \ln f(t) \) and remark that \( \frac{dx^\alpha}{dx} = \alpha x^{\alpha-1} \) for any \( \alpha \in \mathbb{R} \).