Future and present values of income streams NAME:

We will use the following formulas and setups.

Suppose a company has an income stream of $R(t)$ dollars per year for T years. They reinvest the money into an investment with an interest rate of r (decimal form), compounded continuously. The **accumulated, or total, future value of the income stream A** is defined to be how much the money is worth after T years. This amount is given by $A = e^{rT}\int_0^T R(t)e^{-rt}dt$ where t is the variable of integration.

The **present value of the income stream** is defined to be the amount of principal PV that would need to be invested into an account that is compounded continuously at the same rate and for the same amount of time in order to earn the same amount of money as the future value above. This amount is given by $PV = \int_0^T R(t)e^{-rt}dt$. Notice it is the same except it is missing the first factor in front of the integral.

Use these formulas to answer the following questions. Write down the integrals needed but use your calculator to calculate them.

1. A company has an income stream of $30,000 per year for the next ten years. If it reinvests this money at the rate of 5% compounded continuously, what is the future value of this income stream after ten years?

2. How much would the company need to invest into an ordinary, continuously compounded account at the same rate and for the same amount of time in order to realize the same amount as found in #1? (Hint: Find the present value of the income stream.)

3. A company has an income stream of $R(t) = 10,000t$ dollars per year for the next five years. What is the future value of this income stream after five years if it is reinvested at a rate of 6% compounded continuously? (You definitely need to use your calculator to compute this integral.)

4. A company has two income stream possibilities that are outlined below. Find the future values for each possibility to determine which the company should pursue.

> *Possibility A: An income stream of $15,000 per year for the next fifteen years. They would be able to invest the money in an investment paying 4% compounded continuously.*
> *Possibility B: An income stream of $10,000 per year for the next twenty years. They would be able to invest the money in an investment paying 5% compounded continuously.*