WORKSHEET: APPLICATIONS OF INTEGRATION

1. A factory produces bicycles at a rate of $95 - t + 3t^2$ bicycles per week, where t is the number of weeks. How many bicycles were produced from the beginning of week 2 to the end of week 3?

2. A cat falls from a tree with zero initial velocity at time $t = 0$. How far does the cat fall between $t = 0.5$ and $t = 1$ s? (Recall that gravitational acceleration is a constant -9.8 m/s^2.)

3. The population of a city is $P(t) = 2e^{0.06t}$, in millions, where t is measured in years. Calculate the time it takes for the population to double, to triple, and to increase seven-fold.

4. A 10 kg quantity of a radioactive isotope decays to 3 kg after 17 years. What is its half-life?

5. A certain RNA molecule replicates every 3 minutes. If there is one molecule at $t = 0$, how many molecules will be present after 60 minutes?

6. Assume that in a certain country, the rate at which jobs are created is proportional to the number of people who already have jobs. If there are 15 million jobs at $t = 0$ and 15.1 million jobs 3 months later, how many jobs will there be after 2 years?

7. Two bacteria colonies are cultivated in a laboratory. The first colony has a doubling time of 2 h and the second a doubling time of 3 h. Initially, the first colony has 1000 bacteria and the second colony has 3000 bacteriaa. At what time t will the sizes of the colonies be equal?

8. Compute the balancce after 10 years if $2000 is deposited in an account paying 9% interest and interest is compounded (a) quarterly, (b) monthly, and (c) continuously.

9. How long will it take for $4000 to double in value if it is deposited in an account bearing 7% interest, continuously compounded?

10. Is it better to receive $1000 today or $1300 in 4 years? Assume that interested is compounded continuously, and compare $r = 0.08$ and $r = 0.03$.