Lecture: Nghia Lam

**AMB-SB0963**

**Assignment #2**

1. Suppose that you are given the task of learning 100% of a block of knowledge. Human nature is such that we retain only a percentage P of knowledge t weeks after we have learned it. The Ebbinghaus learning model asserts that P is given by P(t) = Q + (100 – Q)e-kt, where Q is the percentage that we would never forget and k is a constant that depends on the knowledge learned. Suppose that Q = 40 and k = 0.7.
2. Find the percentage retained after 0 weeks, 1 week, 2 weeks, 6 weeks, and 10 weeks.
3. Find .
4. Sketch a graph of P.
5. Find the rate of change of P with respect to time t.
6. Interpret the meaning of the derivative.
7. Find the slop of the tangent to the graph of f(x) = 2e-3x at the point (0,2).
8. Given the function

g (x) = 2(1- e-x) , for x ≥ 0

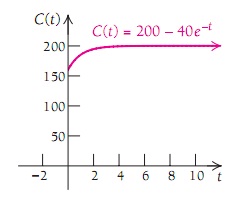
Graph this function. Then determine critical values, inflection points,

intervals over which the function is creasing or decreasing, and concavity.

1. A company’s total cost, in millions of dollars, is given by

C(t) = 200 – 40e-t,

Where t is the time in years since the start-up date.



Find each of the following.

1. The marginal cost C’(t)
2. C’( 0)
3. C’(5) (Round to the nearest thousand.)
4. Find and . Why do you think the company’s costs tend to level off as time passes?

Given and , find each value

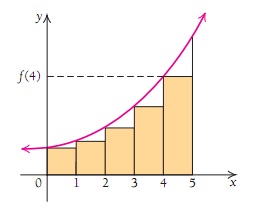
1. The demand for a new computer game can be modeled by p(x)= 53.3 – 8lnx, where p(x) is the price consumers will pay, in dollars, and x is the number of games sold, in thousands. Recall that total revenue is given by R(x) = x.p(x).
2. Find R(x).
3. Find the marginal revenue, R’(x).
4. Is there any price at which revenue will be maximized? Why or why not?
5. Solve P = Poekt for t.
6. Differentiate
7. f(x) = ln(x3+1)5
8. f(x)= ln[ln(ln(3x))]
9. Determine these indefinite integrals
10. .
11. Find the national credit market debt, D(t), during the years 2005 through 2009 given that D(0)= 41,267.
12. A company determines that the marginal revenue, R’, in dollars, from selling the xth unit of a product is given by

R’(x) = x2- 3.

1. Find the total-revenue function, R, assuming that R(0) = 0.
2. Why is R(0) =0 a reasonable assumption?
3. Sylvie’s Old World Cheeses has found that the cost, in dollars per kilogram, of the cheese it produces is

C’(x) = - 0.003x + 4.25, for x≤ 500, where x is the number of kilograms of cheese produced. Find the total cost of producing 400 kg of cheese.

1. a) Approximate the area under the graph of f(x)= x2+1 over the interval [0, 5] by computing the area of each rectangle and then adding.



b)Approximate the area under the graph of f(x)= x2+1 over the interval [0,5] by computing

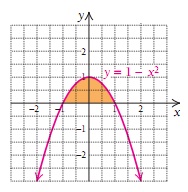
1. Approximate the area under the graph of

g(x) = - 0.02x4+ 0.28x3- 0.3x2+ 20 over the interval [3,12] by dividing the interval into 4 subintervals.

1. Use geometry to evaluate each definite integral

1. Find the area under the given curve over the indicated interval

y = 1-x2; [-1, 1]



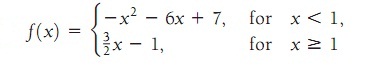
1. Raggs, Ltd., estimates that its sales will grow continuously at a rate given by the function S’(t) = 10et,

where S’(t) is the rate at which sales are increasing, in dollars per day, on day t.

1. Find the accumulated sales for the first 5 days.
2. Find the sales from the 2nd day through the 5th day.

(This is the integral from 1 to 5.)

1. A particle is released during an experiment. Its speed t minutes after release is given by v(t) = - 0.3t2 + 9t, where v(t) is in kilometers per minute.
2. How far does the particle travel during the first 10 minute?
3. How far does it travel during the second 10 min?
4. Find the area under the graph of f over the interval [-6, 4]



1. The emissions of an engine are given by E(t) = 2t2, where E(t) is the engine’s rate of emission, in billions of pollution particulates per year, at time t, in years. Find the average emissions from t=1 to t= 5.

Evaluate

2. Consider
3. Evaluate this integral using integration by parts.
4. Evaluate it using the substitution u = x-3 and observing that

x = u +3.

1. Show algebraically that the answers from part (a) and (b) are equivalent.
2. Given

D (x) = , S(x)=

Where D(x) is the price, in dollars per unit, that consumers are willing to pay for x units of an item, and S(x) is the price, in dollars per unit, that producers are willing to accept for x units.

1. Find the equilibrium point
2. The consumer surplus at the equilibrium point
3. The producer surplus at the equilibrium point
4. Explain why both consumers and producers feel good when consumer and producer surplus exist.
5. In 16 yr, Claire Beasley is to receive $180,000 under the terms of a trust established by her aunt. Assuming an interest rate of 6.2%, compounded continuously, what is the present value of Claire’s legacy?
6. At age 25, Del earns his CPA and accepts a position in an accounting firm. Del plans to retire at the age of 65, having received an annual salary of $125,000. Assume an interest rate of 7%, compounded continuously.
7. What is the accumulated present value of his position?
8. What is the accumulated future value of his position?
9. In 2006 (t= 0), the world consumption of natural gas was approximately 101.4 trillion cubic feet and was growing exponentially at about 2.6% per year. (Source: International Energy Outlook 2005, U.S.Energy Information Administration, U.S. Department of Energy.) If the demand continues to grow at this rate, how many cubic feet of natural gas will the world use from 2006 to 2010?
10. Plutonium-239 has a decay rate of approximately 0.003% per year. Suppose that plutonium-239 is released into the atmosphere for 20 yr at a constant rate of 1lb per year. How much plutonium-239 will be present in the atmosphere after 20 yr?
11. Find the area, if it is finite, of the region under the graph of y = 1/x over the interval [2, ∞).
12. Find the area, if it is finite, of the region bounded by y = , x = 6, and [6, ∞).
13. Suppose that the treatment uses palladium-103, which has a half-life of 16.99 days.
14. Find the decay rate, k, of palladium-103.
15. How much energy (measured in rems) is transmitted in the first month if the initial rate of transmission is 10 rems per year?
16. What is the total amount of energy that the implant will transmit to the body?
17. Find the particular solution determined by the given condition.
18. y’= 3x2-x + 5 ; y = 6 when x = 0
19. f’(x) = x2/3- x ; f(1)= - 6
20. Show that y = xlnx – 5x + 7 is a solution of y’’- = 0
21. Solve

e-1/x.

Determine whether each improper integral is convergent or divergent, and calculate its value if it is convergent.

3. The marginal revenue for a certain product is given by R’(x) = 300 – 2x. Find the total-revenue function, R(x), assuming that R(0) = 0.
4. The reaction R in pleasure units by a consumer receiving S units of a product can be modeled by the differential equation

, where k is a positive constant.

1. Use separation of variables to solve the differential equation.
2. Rewrite the solution in terms of the initial condition R(0) =0.
3. Explain why the condition R(0) = 0 is reasonable.