Math Xa
Worksheet—More Exponential Functions

Fall 2003

1. Evaluate the derivative of each of the following functions.

   (a) $y = xe^{10x}$

   (b) $f(t) = e^t + e^\pi + \pi^e$

   (c) $x(t) = \dfrac{t^3 - 2t + 4}{e^{3t} + 2}$

   (d) $y = \dfrac{e^x - e^{-x}}{2}$

   (e) $f(x) = (x^2 - 2x + 5)e^x$

2. According to a report from the General Accounting Office, during the 14-year period between the school year 1980–1981 and the school year 1994–1995 the average tuition at four-year public colleges increased by 234%. During the same period, average household income increased by 82%, and the Labor Department's Consumer Price Index (CPI) increased by 74%.[1]

    (a) Assuming exponential growth, determine the annual percentage increase for each of these three measures.

    (b) The average cost of tuition in 1994–1995 was $2865 for in-state students. What was it in 1980–1981?

    (c) Starting with an initial value of one unit for each of the three quantities, average tuition at four-year public colleges, average household income, and the CPI, sketch on a single set of axes the graphs of the three functions over this 14 year period.

    (d) Suppose that a family has two children born 14 years apart. In 1980–1981, the tuition cost of sending the elder child to college represented 15% of the family's total income. Assuming that their income has increased at the same pace as the average household, what percent of the income was needed to send the younger child to college in 1994–1995?

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[1] *Boston Globe*, August 16, 1996.