



In Class Exercises (ICE) - 2/12/01

The internet plays a more and more significant role in our everyday lives. Despite some recent signs¹ that the expansion of the internet may be slowing down, the late 1990's saw an explosion of both the number of users and the number of computers (or "hosts") connected to the internet.

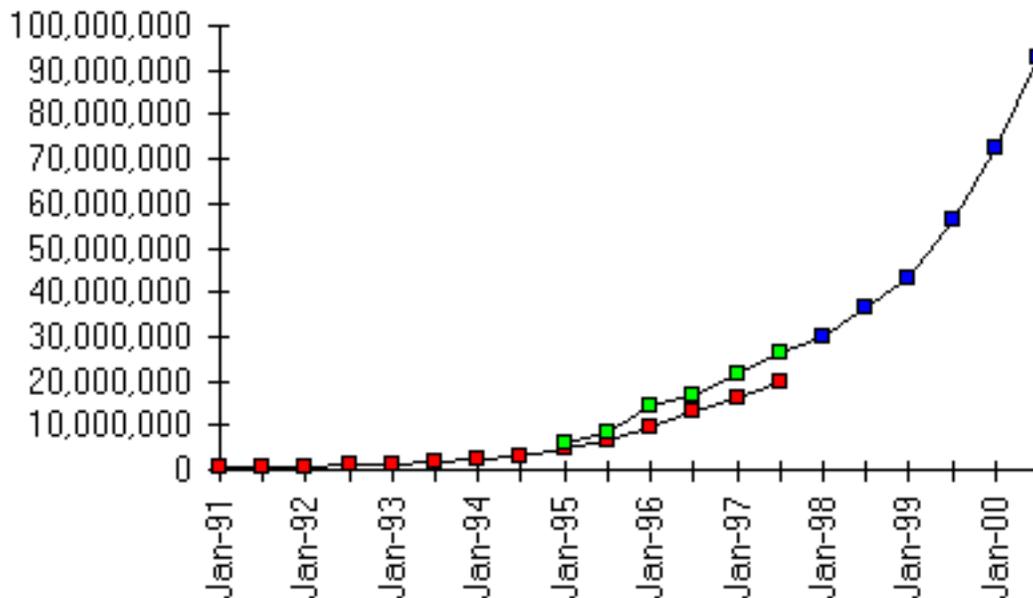


Figure 1: Internet Domain Survey Host Count (1991-2000)².

- **Based on the graph in Figure 1, what sort of function would probably do a reasonable job of approximating the number of hosts on the internet as a function of time?**
- **Find a formula that will give the number of hosts on the internet as a function of time.**
- **Members of the National Center for Supercomputer Applications (NCSA) at the University of Illinois at Urbana-Champaign estimated³ that during the 1990's, the number of hosts on the internet increased by approximately 10% per month. Is this figure consistent with your formula?**

¹ Source: MSNBC Technology News, September 21, 2000. See the complete story "Growth of Internet use slows" by Brock N. Meeks at: <http://www.msnbc.com/news/464681.asp?cp1=1>

² Source: Internet Software Consortium. (<http://www.isc.org>)

³ Source: A. Kanfer (1998) "Easy to Use Software and the Growth of the Internet." Available from: <http://www.ncsa.uiuc.edu/edu/trg>



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The growth of an investment with a fixed interest rate is given by the compound interest formula:

$$P = P_0 \cdot \left(1 + \frac{r}{n}\right)^{nt}$$

where P_0 is the initial investment, r is the interest rate (expressed as a decimal), n is the number of compounds per year, and t is the number of years.



In a compound interest situation, small amounts of interest are added throughout the year. In between these additions of interest, the value of the investment is constant. This is shown in Figure 1, which was generated using the calculator commands:

$$y1 = 100 * (1 + 1.8/N)^{(iPart(N*X))}$$

using monthly compounding interest:

$$[1] [2] [STO>] [\text{ALPHA}] [\text{LOG}]$$

Figure 1: Growth of Investment with monthly compounding interest ($n = 12$)

- **Experiment with different numbers of compounds (that is, different values of the parameter 'N'). What happens to the appearance of the graph as the number of compounds increases?**
- **What sort of formula would do a good job of representing this growth of the value of the account when 'N' gets really big?**
- **Find a formula for the value of the investment as a function of time that works when 'N' is really big, but doesn't actually include 'N' in the formula.**