

Lesson 3.3 - Continuous Compounding & the value 'e'

I. Warm-Up – Martha Stewart deposits \$1 in an account at a very generous bank that pays her 100% interest. Assuming no other deposits and withdrawals, what will her balance be in one year if the interest is compounded:

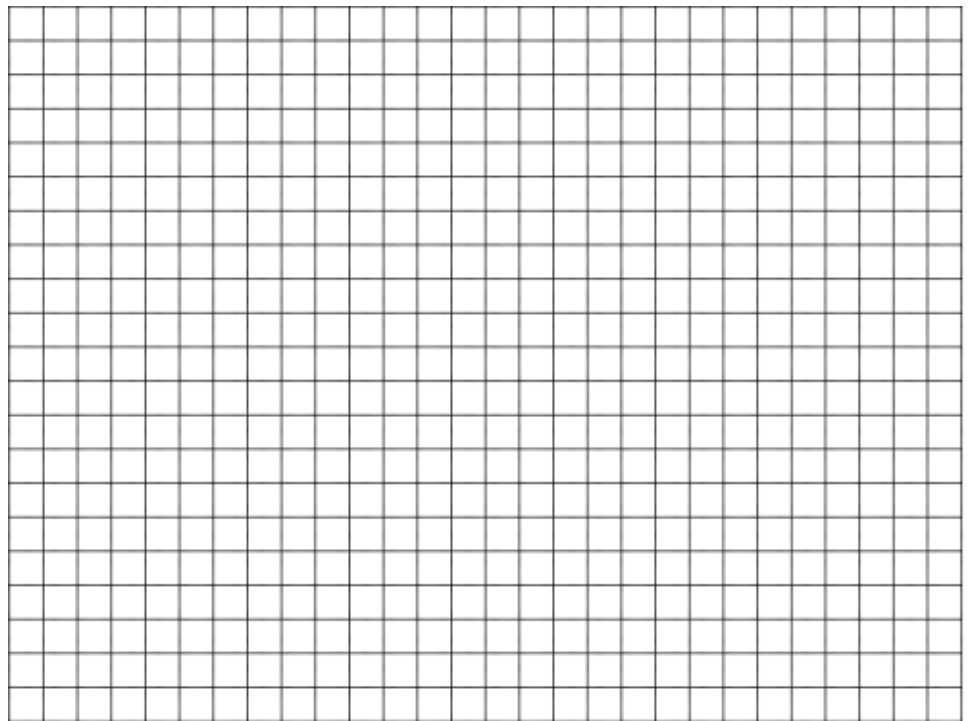
- (a). Quarterly (b). Monthly (c). Daily

d. What do you notice? Can you write a function that gives you the balance after n compoundings in 1 year?

e. **Key Idea** – Will Martha's ending balance ever exceed \$3?

II. The Value 'e' =

2. Sketch a graph of $y = e^x$.



3. On the same graph, sketch a graph of $y = 3e^x + 1$.

4. Evaluate the following functions at the indicated values: (Using your calculator)

- (a). $y = e^x$ at $x = 3.2$ (b). $y = 1.5e^{\frac{x}{2}}$ at $x = 24$ (c). $y = 250e^{0.05x}$ at $x = 20$

III. Continuous Compound Interest

Normal Compound Interest Formula	Continuous Compounding Interest Formula

5. How much will a \$100 deposit earning 6% interest, compounded monthly, yield in 5 years?
6. How much will a \$100 deposit earning 6% interest, compounded continuously, yield in 5 years?
7. Boruto's dad creates a trust fund for Boruto when he is born and deposits 10,000 兩 (ryo). The trust fund pays 9% interest compounded continuously. Determine the balance of this account when Boruto goes to college at the age of 18.
8. The population P (in millions) of Russia from 1996 to 2004 can be approximated by the model $P = 152.26e^{-0.0039t}$, where t represents the year and $t = 6$ corresponding to 1996.
- According to the model, is the population of Russia increasing or decreasing? Explain.
 - Find the population of Russia in the year 1998.
 - Find the population of Russia in the year 2001.

IV. Looking Ahead – Suppose I had an initial deposit of \$10,000. When does my balance reach \$1,000,000 at an annual compounding of 5% interest rate?