Math 105  TOPICS IN MATHEMATICS
SOLUTION FOR QUIZ – IV (02/20)

February 20 (Fri), 2015

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⋆ In problem [I] below we work on a model where one can divide any dollar amount by any large number (integer). Also, we never round figures. So, one-third of a dollar is never the same as 33 cents (because 33 cents is one-third of 99 cents).

[I] (14pts)  You open a bank account, deposit a dollar in that account.

(1)  Your bank offers 100 percent interest annually.

After one year, your balance is  $2.

(2)  Suppose your bank offers a compound interest with 100 percent rate annually.

After two years, your balance is  $4.

(3)  Suppose the compounding takes place semi-annually. So every half-year the 50 percent of your balance will be accrued as an interest.

After one year, your balance is  $2.25.

(4)  Suppose the compounding takes place 12 times annually. So every month

\( = \frac{1}{12}\)-th of a year),  \( \frac{1}{12}\)  times 100 percent of your balance will be accrued as an interest.

After one year, your balance is  

\[
\$ \left( 1 + \frac{1}{12} \right)^{12}.
\]
(5) Suppose the compounding takes place $10^{20}$ times annually. So every $\frac{1}{10^{20}}$-th of a year, $\frac{1}{10^{20}}$ times 100 percent of your balance will be accrued as an interest.

After one year, your balance is $\left(1 + \frac{1}{10^{20}}\right)^{10^{20}}$.

(6) Is your answer in (5) more than or less than $2$?

[Answer]: It is more than $2$.

(7) Is your answer in (5) more than or less than $3$?

[Answer]: It is less than $3$.

[II] (6pts)

(1) $3! = 3 \cdot 2 \cdot 1 = 6$.

(2) $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$. 

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