Evaluating an Interesting Limit

Using $\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n = e$, calculate:

1. $\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^{3n}$
2. $\lim_{n\to\infty}\left(1+\frac{2}{n}\right)^{5n}$
3. $\lim_{n\to\infty}\left(1+\frac{1}{2n}\right)^{5n}$

Evaluating an Interest Using the Limit

Recall that the formula for *compound interest* is:

$$A = P\left(1 + \frac{r}{k}\right)^k$$

and the anual percentage rate is:

$$\text{APR} = \left(1 + \frac{r}{k}\right)^k - 1.$$

Here P is the principal invested, r is the annual "simple" interest rate, A is the amount in the account at a given time, and k determines the frequency with which interest is added to the account.

As k approaches infinity interest is added more and more often; in the limit we say that the interest is *compounded continuously*.

1. Use the fact that $\lim_{n\to\infty}\left(1 + \frac{1}{n}\right)^n = e$ to compute the APR of 5% compounded continuously.
2. Compute the APR of 10% compounded continuously.

18.01SC Single Variable Calculus
Fall 2010