

Math 142 Lecture Notes

Section 4.1 – The Constant e and Continuous Compound Interest

Definition: The Number e

$$e = \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n \quad \cdot \text{ and is approximately } 2.718281828459\dots$$

Note: The number e is an irrational number. An alternate form of the definition is:

$$e = \lim_{s \rightarrow 0} (1 + s)^{1/s}$$

★ Continuous Compound Interest:

$$A = P \cdot e^{r \cdot t}$$

where A = the amount accumulated at time t ,
 P = the principal amount of money,
 r = the annual interest rate (expressed as a decimal),
 t = the time expressed in years.

Sample problems:

1. If \$3500 is invested at 8.25% compounded continuously for 3 years, how much to the nearest cent will be in the account?
2. If \$400 is invested at $5\frac{3}{4}$ % compounded continuously for 6 months, how much to the nearest cent will be in the account?
3. How long will it take an investment of \$1200 to grow to \$5000, if invested at 7% compounded continuously?
4. Which is the better option to borrow \$24,000 to buy a new truck?
 - A. Bank A which offers $7\frac{1}{4}$ % interest compounded continuously for six years, or
 - B. Bank B which offers $6\frac{1}{2}$ % interest compounded semiannually for seven years.