

Math III Exponential/Geometric Series

Exponential functions are of the form $y = a(b)^x$, where a is the y-intercept or initial amount, and b is the growth/decay factor. If b is $b > 1$ it represents exponential growth and if $0 < b < 1$ it represents exponential decay.

$$\text{Ex/ } f(x) = 5,236(1.08)^x \text{ exponential growth, growth rate is 8\%}$$

$$\text{Ex/ } f(x) = 2,873(0.91)^x \text{ exponential decay, decay rate is 9\%}$$

Compounded interest uses the formula $A = p\left(1 + \frac{r}{n}\right)^{nt}$, where p is the principle, r is the rate, t is the time, and n is the number of times the interest is compounded. (monthly $n = 12$, weekly $n = 52$, etc.)

Continuously compounded interest uses the formula $A = Pe^{rt}$, where p is the principle, r is the rate, and t is the time.

Mortgage Formula - monthly payment $= \frac{pi}{1 - (1+i)^{-n}}$ where p is the principle, n is the number of total payments, i is the monthly interest rate.

Sum of finite geometric series is found by $S_n = \frac{a_1(1-r^n)}{1-r}$, where a_1 is the first term, r is the ratio (what each term is multiplied by to get to the next), n is term number the series stops.

Examples:

1. 288, -96, 32, ... What is the approximate value of the sum of the 7th term?
2. $360 + 480 + 640 + \dots$ What is the approximate value of the sum of the 15th term?
3. What is the approximate value of the sum:

$$8 - \frac{8}{7} + \frac{8}{49} - \dots - 8 \cdot \left(\frac{-1}{7}\right)^{2500} ?$$

4. Find the monthly payment of \$175,000 home on a 30 year mortgage with a 3.5% interest rate.

5. Angela deposited \$3000 into a savings account earning 4% interest compounded continuously, how much will she have after 6 years?

6. Sam deposited \$5,500 into a savings account earning 5.6% interest compounded monthly. How many years had he been saving when the savings account has a balance of \$8599.52?

7. Mary wants a dress that costs \$450 for the prom. So far she has saved \$275 and put it in a savings account for 1.5 years, what interest rate must she earn to have \$450 by prom?

8. A board is made up of 9 squares. A certain number of pennies is placed in each square, following a geometric sequence. The first square has 1 penny, the second has 2 pennies, the third has 4 pennies, etc. When every square is filled, how many pennies will be used in total?
A. 521 B. 511 C. 256 D. 81