Midterm corrections:

(1) THANK YOU!

(2) Give me ~1 week to grade.

Survey:

(1) THANK YOU!

(2) HW Problems:

- Check assignment at the beginning of each week & make adjustments.
- Do odds!
- 

(3) Test week OH will be voted on

(4) Weekly Thursday videos.

Today's goals:

(1) Continuously compounding interest

(2) Continuous growth rates

P_0 = initial amount

r = annual interest rate

t = years

If interest is compounded continuously, then the total amount after t years is,

$$\boxed{P(t) = P_0 e^{rt}}$$

Ex (1) Suppose I place \$10,000 in a bank that compounds continuously at an annual rate of 0.05%. How much do I have after 1 yr?

$$P(1) = 10000e^{0.0005(1)}$$
$$= 10005 \quad \text{(sad)}$$

Ex (2). Suppose I initially place \$10000 in a bank account that compound continually at an annual interest rate of 2.5%. After 6 months I add \$5000 to the account. How much money does the account have after 2 yrs?

Compute the amount the account has after 6 months...

$$10000e^{0.025(1/2)} + 5000 = 15125.78$$

Now compute interest collected after I insert the extra $5000,

$$15125.78\,e^{0.025(3/2)} = \$15703$$

p_0 = initial amount
r = growth rate per unit time
t = time

If a quantity has a continuous growth rate, then after t time the new amount is

$$\boxed{p(t) = p_0 e^{rt}}$$

EX(3). Suppose a bacteria colony has a growth rate of 12% per hour. The colony has 10 cells initially.

↑ t is in hours.

(A) What is the population size after 4 hrs?

$$p(t) = 10e^{0.12t}$$

$$p(4) = 10e^{0.12(4)} = 10e^{0.48} \sim 16$$

(B) How long does it take the population to double in size?

$$20 = 10e^{0.12t}$$
$$2 = e^{0.12t}$$
$$\ln 2 = \ln(e^{0.12t})$$
$$\ln 2 = 0.12t \cdot \ln(e)$$
$$\ln 2 = 0.12t$$
$$t = \frac{\ln 2}{0.12} \sim 5.78 \text{ hrs}$$

Ex(4). Suppose a quantity has continuous growth r. Compute a formula for the doubling time of the population.

r – is %.

$R = \frac{r}{100}$ (the decimal form)

$$2 = e^{Rt} \Rightarrow Rt = \ln 2$$

$$t = \frac{\ln 2}{R} = \frac{100 \cdot \ln 2}{r}$$

Ex (5). Consider two populations of bacteria
(pop 1) Starts with 1000 bacteria and has a continuous growth rate of 10% per hour.
(pop 2) Starts with 100 bacteria and has a continuous growth rate of 15% per hour.
After how many hours will Pop 2 exceed pop 1.