Continuous Exponential Growth (7.3) p364 day 6

Assignment 5

make some food

write up ~ 1 page

how math from 621B was used in making the food

try to hit every chapter we've done

be specific, use examples

show me math

bring enough for 6 people due Monday Dec 13

food allergies? Halal?

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The Dark Network

Elsewhen

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13. A savings bond offers interest at a rate of 6.6% per year, compounded semi-annually. Suppose that you buy a $500 bond.

a) Write an equation for the value of the investment as a function of time, in years.

b) Determine the value of the investment after 5 years.

c) How long will it take for the bond to triple in value?

$A = 500\left(1+\frac{0.066}{2}\right)^{2n}$

$1500 = 500(1.033)^{2n}$

$3 = (1.033)^{2n}$

$\ln 3 = 2n$

$7 = n$

9. A bacterial culture starts with 2000 bacteria and doubles every 0.75 h. After how many hours will the bacteria count be 32 000?

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ex1: You invest $1 at the Bank of Ecstasy, which pays 100% interest and you get to pick the compounding period. How much will you have in 1 year if you compound...

annually	$1\left(1+\frac{1}{1}\right)^{1}$	$= \$2$
semi-annually	$1\left(1+\frac{1}{2}\right)^{2}$	$= \$2.25$
quarterly	$1\left(1+\frac{1}{4}\right)^{4}$	$= \$2.44$
monthly	$\left(1+\frac{1}{12}\right)^{12}$	$= \$2.61$
weekly	$\left(1+\frac{1}{52}\right)^{52}$	$= \$2.69$
daily	$\left(1+\frac{1}{365}\right)^{365}$	$= \$2.71$
31 536 000 per second	$\left(1+\frac{1}{31536000}\right)^{31536000}$	$\$2.718$
∞ continuously	$\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^{n}$	$= 2.718281828459\ldots$

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We are approaching 2.718281828459... e

We call this irrational number e (named for Leonhard Euler)

$$\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^{n} = 2.718281828459...$$

Many things grow exponentially with base e.
This is called **continuous** growth.

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ex2: Stratford's population is 8,574 and it is growing continuously at 6% per year. What will the population be in 10 years?

$P(10) = 8574e^{(0.06)(10)}$

$= 15,623$

$P(t) = P_o e^{rt}$

r is the rate as a decimal
t is the time

When will the pop. hit 34,500 and tie Charlottetown?

$34\,500 = 8574e^{0.06t}$

$4.02 = e^{0.06t}$

$\frac{\ln 4.02}{0.06} = t$

$23.24 = t$

$\frac{\ln \text{answer}}{\text{exponent}}$

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ex3: The amount of caffeine left in your body as a function of time is:

$$P(t) = 100e^{-0.14t}$$

What % is left after 5 hours?

$P(5) = 100e^{(-0.14)(5)}$

$= 49.66$

When will there be 25% left?

$25 = 100e^{-0.14t}$

$0.25 = e^{-0.14t}$

$\frac{\ln 0.25}{-0.14} = t$

$9.9\text{h} = t$

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hw: growth sheet