10.7 Application$ Day 2

Test WED 4/25, Project due THURS 4/26, Extra Credit due FRI 4/27

Warm-Up Thursday

Evaluate - show all steps!

1. $9^{\log_3 5}$

$3^{2\log_3 5}$

$3^{\log_3 5^2}$

5^2

25

2. $\log_4(\log_2(\log_2 16))$

$2^{\square}=16$

$\log_4(\log_2 4)$

$2^{\square}=4$

$\log_4 2$

$4^{\square}=2$

1/2

About Me

1. Would you rather be forced to dance every time you heard music or be forced to sing along to any song you heard?

2. Would you rather be famous but ridiculed or be just a normal person?

Banking Applications

When working a banking problem, you need to know if the interest rate is compounded continuously, or at a specific interval. This will tell you which formula to use.

If the interest is compounded continuously use:

$$A = Pe^{rt}$$

If the interest is compounded after a specific interval, use: $A = P\left(1+\frac{r}{n}\right)^{nt}$

quarterly $n=4$ weekly $n=52$ monthly $n=12$ annually $\rightarrow 1$ daily $n=365$

A = amount after t years
P = principal or inital amount
r = interest rate, written as a decimal
n = number of times compounded in 1 year
t = number of years

Example 3: Sam is investing $800 into an account that earns 3% annual interest.

a) If the interest is compounded monthly, how much would he have after 5 years?

$A = P(1+\frac{r}{n})^{nt}$ $= 800(1+\frac{.03}{12})^{12\cdot 5}$

$A = ?$ $P = 800$ $r = .03$ $n = 12$ $t = 5$

NORMAL FLOAT AUTO REAL RADIAN MP
$800(1+\frac{.03}{12})^{12*5}$
929.2934252

$\$929.29$

b) If the interest is compounded continuously, how much would he have after 5 years?

$A = Pe^{rt} = 800e^{(.03)(5)}$

$\$929.47$

Example 4: Mrs. Scott has $3500 invested in an account at 5% annual interest rate compounded monthly. How long will it take for her account to reach $5000?

$A = P(1+\frac{r}{n})^{nt}$

$A = 5000$ $P = 3500$ $r = .05$ $n = 12$ $t = ?$

$\frac{5000}{3500} = \frac{3500(1+\frac{.05}{12})^{12t}}{3500}$

$1.429 = (1.0042)^{12t}$

$\frac{\log_{1.0042} 1.429}{12} = \frac{12t}{12}$

$t \approx 7$ years

Example 5: Mary invested [illegible] rest was compounded quarterly and the money h[illegible] rate rounded to one decimal?

NORMAL FLOAT AUTO REAL RADIAN MP
5000/3500
1.428571429
$\log_{1.0042}(1.429)$
85.17238633
Ans/12
7.097698861
$\log_{1.004166667}(1.428571429)/12$
7.148349471

10.7 Application$ Day 2

LOGS CSI Project (TEST grade, due Thursday 4/26)

- You can work with up to 3 group members
- Follow the rubric!
- EVERYONE turns in their work (project paper)
- ONE PERSON turns in the project presentation
- Today: figure out the fun stuff (who is murdered, the suspects, etc) and tomorrow we will work through the math part

Pre-Calculus

RHS – CSI

Name: _____

Other group members:

_____

You have just discovered a murder victim. You decide to take it upon yourself to solve this crime.

Newton's Law of Cooling states that the rate of cooling of an object is proportional to the temperature difference between the object and its surroundings. By taking temperature readings of the object and the room (the "environment"), you are able to determine the time of the murder.

Things you need to know:

Time the body was found: _____
Temperature of the body at that time: _____
Surrounding Temperature: _____
Temperature of the body 30 minutes later: _____
(Remember the corpse gets colder as time elapses)
Assume normal body temperature to be 98.6°.

$$T(t) = T_E + (T_O - T_E)e^{-kt}$$

(This formula is used twice when solving these problems; follow the example from in class)

Project Requirements:

- You need to come up with a list of 4 suspects. Each has his/her own alibi that accounts for certain times of the day. Every suspect has some unaccounted time of the day in their alibi. Of course each suspect's unaccounted time should be different. Each suspect must have at least 3 different details in his/her alibi.

  ex. Suspect 1: _____

  Alibi detail 1: at school from 9:00 – 2:00
  Alibi detail 2: seen at Starbucks 2:15 – 3:45
  Alibi detail 3: home studying from 5:30 until bed time
  Unaccounted time: **2:00 – 2:15 and 3:45 – 5:30**

Pre-Calculus

- You will be presenting your project to the class on Thursday April 26.
- Each presentation must include some type of visual aids, such as power point, video, "evidence folder," etc. Be creative! (No posters please). All props must be SCHOOL APPROPRIATE!!!!
- You will turn in your project packet individually with the information listed in on page 1 (temperatures, times, etc.).
- You will use Newton's Law of Cooling to determine the time of death, thus solving your case. You must show all work from the formula, and you must include the name of the culprit.
- You must present your math in your presentation then reveal the name of the perpetrator
- You may not use any of the same combinations of numbers used in the examples. Do not use the alibi details given in our example. Your numbers must be unique from all of the other groups so I will give you the temperature when you found the body and the temperature 30 minutes later

This project will count as a TEST GRADE! Please follow all directions and deadlines. YOUR ENTIRE PROJECT MUST BE SCHOOL APPROPRIATE!!! If it is not, it will be sent to administration. Please ask questions. Please impress us with your creativity. Remember, it's a test grade!

By the way, it's a test grade.

For your project, please fill in the information provided, and use the facts to solve the mystery.

Project name(s): _____

Brief description: _____

Time the body was found: _____
Temperature of the body at that time: _____
Surrounding Temperature: _____
Temperature of the body 30 minutes later: _____
4 Suspects (include in visual and presentation)

- Details, motive, alibis, unaccounted time

Pre-Calculus

Work shown to determine time of death:

k = _____ t = _____

Therefore, the crime occurred at _____ (time),

so the criminal was _____!

Pre-Calculus

Grading Rubric

Your project counts as a quiz grade. Your grade will be determined by the sum of the points given below:

_____ /40 Work (math)
Math is correct, all work shown, suspect identified, turned in on correct due date

_____ /28 Suspects (7 points each)
Suspect identified, motive (1 point) 3 details per suspect (1 point each), unaccounted time correct (1 point), visual for the suspect (2 pts)

Suspects: 1 _____ 2 _____ 3 _____ 4 _____

_____ /32 Presentations
Some type of visual provided, clear presentation, all introductory information included (time body found, temperature, room temperature, later body temperature), prepared on due date

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EXTRA CREDIT!

_____ /5 WOW factor
We will vote for the highest quality and most creative presentations.

_____ /100 Total = Quiz Grade

#1,2,3,7,9

Pre-Cal Unit 10 – Application of Exponential and Logarithmic Functions

Practice - Application of Exponential and Logarithmic Functions

Name _____ Date _____ Period_____

Solve:

1. A $4,000 deposit is made at a bank that pays 6% compounded annually. How much will you have in your account at the end of 10 years?

2. If you invested $12,000 in an account paying an annual percentage rate of 8%, compounded continuously, how much would you have in your account at the end of 5 years?

3. Recently, Tom found he was a distant relative of General James Wolfe who died at the battle on the Plains of Abraham in 1759. When he died in 1759 he left $600 in his will which now belongs to Tom. The money has been in a savings account where it has been earning interest at 4% per year, compounded annually. How much will Tom have in the year 2015?

4. You bought your home for $420,000 and its value increases each year by 8%. Approximately, how many years will it take for the house to be work $600,000?

Pre-Cal Unit 10 – Application of Exponential and Logarithmic Functions

5. The Houston Astrodome was the first baseball and football stadium to be completely enclosed. It was completed in 1965 at a cost of 45.35 million dollars. Construction costs have increased approximately 6% each year since 1965. How much would it cost to build the Astrodome today?

6. Karen has $5000 to invest in two stocks. She decides to invest $3200 in TI stock that pays 11.3% interest and $1800 in a Movie Company stock that pays 10.5% interest in which both were compounded daily. How much money would she make after investing for two years?

7. John Matterson wants to save $7000 as a down payment for a car that he plans to buy in 6 years. How much money should he deposit into a Money Market account that pays 6.5% interest compounded continuously to earn his down payment?

8. Jason and Laura are buying a house. They secured a $98,000 loan, which charges a 6.75% annual interest. If the loan is for 30 years, how much will the monthly payments be?

9. When her son was 4 years old, Marcy invested $5000 of the money she earned in an account paying 8% interest compounded quarterly. Marcy wants to withdraw the money to help with her son's college expenses when it grows to somewhere between $15,000 and $25,000. How long must the money be left in the bank to grow to this range of amounts?

2.7 → e

Banking Applications
When working a banking problem, you need to know if the interest rate is compounded continuously, or at a specific interval. This will tell you which formula to use.

If the interest is compounded continuously use:

$$A = Pe^{rt}$$

If the interest is compounded after a specific interval, use: $A = P\left(1+\frac{r}{n}\right)^{nt}$

A = amount after t years
P = principal or inital amount
r = interest rate, written as a decimal
n = number of times compounded in 1 year
t = number of years

monthly = 12
semi annual = 2
daily = 365

Example 3: Sam is investing $800 into an account that earns 3% annual interest.
a) If the interest is compounded monthly, how much would he have after 5 years?

P, r = .03, t

$A = P\left(1+\frac{r}{n}\right)^{nt}$ n = 12

$A = 800\left(1+\frac{.03}{12}\right)^{12 \cdot 5}$

$A = \$929.29$

b) If the interest is compounded continuously, how much would he have after 5 years? t

$A = Pe^{rt}$

$A = 800\, e^{(.03)(5)}$

$A = \$929.47$

Example 4: Mrs. Scott has $3500 invested in an account at 5% annual interest rate compounded monthly. How long will it take for her account to reach $5000?

2nd Formula

P, A

$5000 = 3500\left(1+\frac{.05}{12}\right)^{12t}$

$\frac{5000}{3500} = \frac{3500(1.004)^{12t}}{3500}$

$1.429 = 1.004^{12t}$

$\log_{1.004} 1.429 = \frac{12t}{12}$

NORMAL FLOAT AUTO REAL DEGREE MP

800(1+(.03/12))^(12*5) 929.2934252
1+(.05/12) 1.004166667
5000/3500 1.428571429
log_1.004(1.429) 89.42209343

$t = 7.45$ years

Example 5: Mary invested $2000 in an account 7 years ago. If the interest was compounded quarterly and the money has doubled in that time, what was the interest rate rounded to one decimal?

4, r

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

$\frac{4000}{2000} = \frac{2000\left(1+\frac{r}{4}\right)^{4 \cdot 7}}{2000}$

$(2)^{1/28} = \left(\left(1+\frac{r}{4}\right)^{28}\right)^{1/28}$

$1.025 = 1 + \frac{r}{4}$

$-1 \quad -1$

$4 \cdot 0.025 = \frac{r}{4} \cdot 4$

$0.1 = r$

10%