

Test 2
Dusty Wilson
Math 111

Name: Key

Seeing there is nothing that is so troublesome to mathematical practice, nor that doth more molest and hinder calculators, than the multiplications, divisions, square and cubical extractions of great numbers ... I began therefore to consider in my mind by what certain and ready art I might remove those hindrances.

No work = no credit

No Symbolic Calculators

John Napier (1550 - 1617)
Scottish mathematician

Warm-ups (1 pt each):

$-2^2 = -4$

$\log_3(3) = 1$

$e^0 = 1$

space.

1.) (1 pt) Based upon the quote above, how why did Napier invent the logarithm? Answer using complete English sentences.

He wanted to make life easier.

2.) (4 pts) Solve $\frac{3x}{4} - \frac{1}{3} = 1 - \frac{2}{3}\left(x - \frac{1}{6}\right)$

$\Rightarrow \frac{3x}{4} - \frac{1}{3} = 1 - \frac{2}{3}x + \frac{2}{18}$

$\Rightarrow 27x - 12 = 36 - 24x + 4$

$\Rightarrow 51x = 52$

$x = \frac{52}{51}$

3.) (4 pts) The population of Somalia was 9.36 million in 2010 and growing by 2.2% annually. Set up an exponential model describing the population and use it to ^{algebraically} determine the year when the population of Somalia will reach 15 million.

$P(t) = 9.36(1.022)^t$ where t is in yrs since 2010.

$15 = 9.36(1.022)^t$

$\Rightarrow \frac{15}{9.36} = 1.022^t$

$\Rightarrow t = \frac{\ln(15/9.36)}{\ln(1.022)} \approx 21.67$

Model: $P(t) = 9.36(1.022)^t$

Year: 2031 & 8 Mo.

4.) (2 pts) Is $e = \frac{260412269}{95800320}$? Explain.

No, e is irrational.

5.) (4 pts) Write the expression $2\log_4 x + \frac{1}{3}\log_4(x+1)$ as a single logarithm.

$$\log_4(x^2 \sqrt[3]{x+1})$$

6.) (2 pts) If $\log_b(2) = u$ and $\log_b\left(\frac{3}{2}\right) = v$, find the value of $\log_b\left(\frac{3}{2}\right)$ in terms of u and v .

$$\log_b\left(\frac{3}{2}\right) = \log_b(3) - \log_b(2)$$

$$v - u$$

7.) (4 pts) Evaluate $\log_7 13$ to four decimal places.

$$\log_7 13 = \frac{\ln 13}{\ln 7}$$

$$1.2181$$

8.) (4 pts) Find the sum of the first 200 terms of the arithmetic sequence 12, 9, 6, ...

$$a_n = 12 - 3(n-1)$$

$$a_{200} = 12 - 3(199) = -585$$

$$S = \frac{200(12 + (-585))}{2}$$

$$-57300$$

9.) (4 pts) Absalom invested \$5000 at 7% compounded continuously. What is the value of the investment after 9 years? Answer using a complete sentence.

$$A = 5000 e^{0.07(9)} = 9388.05$$

Absalom has \$9388.05

10.) (4 pts) How much must Saul invest today at 11% compounded semiannually to have \$30,000 in 14 years? Answer using a complete sentence.

$N = 2 \cdot 14$
$I\% = 11$
* $PV = \$6699.65$
$PMT = 0$
$FV = 30000$
$P/Y = 2$
$C/Y = 2$

Saul needs \$6,699.65 today!

2/2 if an annuity

11.) (4 pts) Jael saves \$4 at day (365 days a year). What interest rate (compounded daily) must she receive to save \$8,000 in 4 years? Answer using a complete sentence.

$N = 4 \cdot 365$
* $I\% = 15\%$
$PV = 0$
$PMT = 4$
$FV = 8000$
$P/Y = 365$
$C/Y = 365$

Jael invest her stake of coffee money @ 15%.

12.) (4 pts) Abigail borrowed \$100,000 at 5%. She paid the loan off after 25 years of monthly payments. How much interest did she pay over the life of the loan? Answer using a complete sentence.

$N = 12 \cdot 25$
$I\% = 5$
$PV = 100,000$
$PMT = \$584.59$
$FV = 0$
$P/Y = 12$
$C/Y = 12$

Total paid: $584.59 = 175,377$

principle:

interest

$- 100,000$

$\$75,377$

Abigail paid \$75,377 in interest

13.) (4 pts) Ruth invests \$100 at the end of each month beginning at the age of 20. After 15 years of contributions, she stops making deposits and just leaves the money in the account. How old will Ruth be when the account is worth \$1,000,000 if the invests ~~earn~~ earn a constant rate of 9%, compounded monthly? Answer using a complete sentence.

N= 12 · 15	*N= 438.22
I%= 9	I%= 9
PV= 0	PV= 37840.58
PMT= 100	PMT= 0
*FV= 37840.58	FV= 1,000,000
P/Y= 12	P/Y= 12
C/Y= 12	C/Y= 12

$$180 + 438 = 51.5 \text{ yrs}$$

she will be 71.5 yrs old

14.) (4 pts) Nathan borrowed \$170,000 at 6% for 30 years. After 5 years of monthly payments, he refinanced the balance at 4% for 20 years. What was total amount Nathan paid over the life of the loans? Answer using a complete sentence.

N= 12 · 30	N= 12 · 20
I%= 6	I%= 4
PV= 170,000	PV= 158,192.41
*PMT= 1019.24	*PMT= 958.61
FV= 0	FV= 0
P/Y= 12	P/Y= 12
C/Y= 12	C/Y= 12

balance in 5 yrs:
\$158,192.41

Total paid:
 $60(1019.24) + 240(958.61)$
\$291,220.80

Nathan paid \$291,220.80

3/4 for 219,453.60

For those interested, remember the BBQ and Movie night on Monday at 5pm☺.