| NAME: (1 pt) | NUMBER: (1 pt) |

MAT 119, Finite Mathematics, Dr. Carol JVF Burns
This exam is closed book, closed notes, closed neighbor, and open mind.
A calculator is required.
Show work leading to answers to receive full credit. Good luck!

The following formulas may (or may not) be useful:

$$S = R\left(\frac{(1+i)^N - 1}{i}\right) \qquad P = R\left(\frac{1 - (1+i)^{-N}}{i}\right) \qquad R = \frac{Pi}{1 - (1+i)^{-N}} \qquad R = \frac{iS}{(1+i)^N - 1}$$

1.
- (4 pts) What is the Simple Interest Formula? Tell the meaning of all variables in this formula.

- (4 pts) What is the Compound Interest Formula? Tell the meaning of all variables in this formula.

2. (5 pts)
A pizza shop offers four types of crusts, three types of cheese, and ten toppings. A pizza doesn't have to have cheese, but it must have a crust. How many choices are there for a single-topping pizza? Be sure to show work leading to your answer.

3.

Carol, Ray, Julia, and Tony have four different savings plans for a Christmas fund.
Each person contributes exactly the same amount of money throughout the year, but they do it in different ways.
All four scenarios use 5% annual interest; all scenarios involve investing for exactly one year.
In each case below, compute the amount of money available at the end of the year.
In each case, clearly show the formula you are using, and clearly identify the values for each of the variables in the formula.

- (3 pts) Carol invests $624 at the beginning of the year, and receives only simple annual interest.

- (4 pts) Ray invests $624 at the beginning of the year; his money is compounded monthly.

- (4 pts) Julia invests $52 per month; her funds are compounded monthly.

- (4 pts) Tony invests $12 per week; his funds are compounded weekly.

Now, answer these additional questions:
- (2 pts) Check that each person invests the same amount of money: how much money is this?

- (2 pts) Who ends up with the most money at the end of the year?

- (2 pts) Different plans have different advantages/disadvantages. Which savings plan would work best for you personally, and why?

4.

- (2 pts)   What does $(1 + \dfrac{1}{n})^{n}$ get close to, as n gets bigger and bigger?

- (3 pts)   What is the Continuous Compounding Formula? Identify all variable(s) in this formula.

- (3 pts)   What does 'continuous compounding' mean?

- (6 pts)   Find the interest rate needed for an investment of $500 to grow to $2000 in five years, if interest is compounded continuously.

5.

- (8 pts) An equation like the one below can arise when you're trying to find the total number of periods in an annuity; here, N has units of years. Solve this equation for N, showing all work leading to your answer. Be sure to get an EXACT answer first (don't do any rounding along the way); give your answer as a decimal, rounded to four decimal places.

$$30000 = 2000 \left(\frac{(1+0.10)^N - 1}{0.10} \right)$$

- (5 pts) Decimal years are often more meaningful when expressed in different units. Express **5.7** months in units of years, months, and days:

  5.7 months = _____ years + _____ months + _____ days

  Be sure to show work leading to your answer.

6.

- (7 pts)   You're buying a new car, that costs $20,000. You put down 25% as a down-payment, and finance the rest, at an 8% annual rate, compounded monthly. What will your monthly payments be if the car is financed over a three year period?

- (3 pts)   What is the total amount of interest paid over the three year period?

7.

650 magazine customers were surveyed.
250 read National Geographic.
150 read Scientific American.
400 read Reader's Digest.
100 read both National Geographic and Scientific American.
60 read both Scientific American and Reader's Digest.
75 read both National Geographic and Reader's Digest.
40 read all three magazines.

- (5 pts) In the space provided below, make a Venn diagram that illustrates this information.
- (2 pts) How many read none of these magazines?

- (2 pts) How many read National Geographic, or Scientific American, but not both?

8.

Let $\mathcal{U}$ be a universal set, where $\mathcal{U} = \{1,2,3,4,5,6\}$.
Let $A = \{1,2\}$ and $B = \{2,5,6\}$.

- Find the following sets:
  (2 pts) $A \cup B$
  (2 pts) $A \cap B$
  (2 pts) $\bar{A}$
  (2 pts) $\overline{A \cup B}$
- (1 pt) Is A a finite set, or an infinite set?

- (1 pt) How many elements does B have?

- (1 pt) Is $\frac{6}{3}$ a member of A?

- (3 pts) List three proper subsets of A:

- True or false (circle the correct answer):
  (1 pt) T   F $1 \in A$
  (1 pt) T   F $A = \{2,1\}$
  (1 pt) T   F $2 \notin A$
  (1 pt) T   F $\emptyset \subseteq B$