Unit IV Journal — Chapters 7 & 8 **Name ____________________**

Respond to each item, giving sufficient detail. Neatly handwrite your responses. *This should be very helpful to you as you prepare for exams.*

1. The three types of probability are:

   (1) theoretical (classical) (2) ________________ (3) ________________

   Give the classical probability formula for the **probability of any event** A, using S for the sample space with all equally likely outcomes.

   P(A) =

   The probability of an event is always between _____ and _____ .

   If A represents any event, the probability that event A does not occur is ______________ .

   Using the given probability of an event, find the probability that it does not occur.

   $\frac{1}{6}$ ________ 35% ________ 0.9 ________

2. Two events are **independent** if the outcome of one does not affect the probability of the other event. Consider two independent events, A and B, with individual probabilities, P(A) and P(B). The probability that A and B occur together is

   P(A and B) = ______________________

   For example, toss 2 coins. Find the probability of a “head” on both.

   ____

   Two events are ________________ if the outcome of one affects the probability of the other event. The probability that dependent events A and B occur together is

   P(A and B) = ______________________ where P(B given A) means “the probability of event B given the occurrence of event A.”

   For example, a bag contains five red balls and eight white balls. If you select 2 balls at random without replacement, find the probability that you get 1 red ball and 1 white ball.

   ____

3. Complete the formulas below, and draw a Venn diagram to illustrate each rule.

For events that are **non-overlapping** (mutually exclusive), P(A or B) = _______________

For events that are **overlapping** (i.e., they can occur together),

P(A or B) = ___________________________

4. (a) A town is growing by 5,000 more people every year. This is an example of __________ growth (linear or exponential). If the town has a current population of 235,000 and this steady growth continues, what will the town's population be in 2 years? Show your work below.

(b) A town is growing by 5% each year. This is an example of __________ growth (linear or exponential). If the town has a current population of 235,000 and this growth continues, what will the town's population be in 2 years? Show work.

5. Find a function rule for the following data tables.

y = ______________________

x	*y*
-2	-6
-1	-2
0	2
1	6
2	10
3	14

f(x) = ______________________

x	*f(x)*
-2	1/9
-1	1/3
0	1
1	3
2	9
3	27

6. For a quantity growing exponentially at a rate of P% per time period, the doubling time is

$T_{double} \approx$ ________________

This approximation works best for small growth rates and breaks down for rates over about 15%.

For example, if the APR is 5%, the approximate doubling time is __________ years.

If the APR is 10%, the approximate doubling time is __________ years.

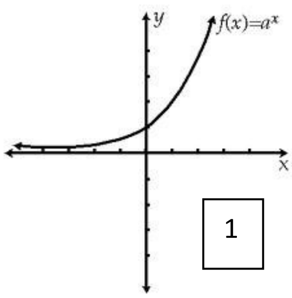
For a quantity decaying exponentially at a rate of P% per time period, the half-life is given by the formula

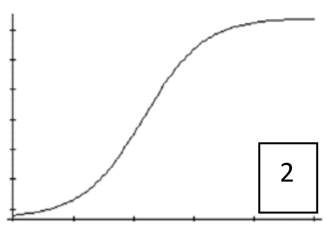
$T_{half} \approx$ ________________

This approximation works best for small decay rates and breaks down for rates over about 15%. The exact formulas both involve logarithms. True or False. __________

7. Match the following graphs with their corresponding function type.

(a) logistic _____ (b) exponential _____



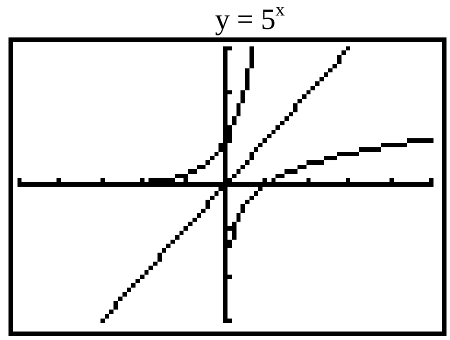


Consider a population that begins growing exponentially at a base rate of 4.0% per year and then follows a logistic growth pattern. If the carrying capacity is 40 billion, find the actual growth rate when the population is 10 billion.

Use the formula: $$\text{logistic growth rate} = r \times \left(1 - \frac{\text{population}}{\text{carrying capacity}}\right)$$

8. Label the following graphs with the corresponding equations from the following list:

$y = 5^x$, $y = x$, and $y = \log_5 x$



Complete the following chart of logarithm rules, along with their rationale.

1. $\log_a a = 1$ because ___________ .	5. $\log_a$_____ $= \log_a M + \log_a N$ since $a^M \cdot a^N = a^{M+N}$.
2. ___________ because $a^0 = 1$.	6. $\log_a \dfrac{M}{N} = \log_a M$ ___ $\log_a N$ since $\dfrac{a^M}{a^N} = a^{M-N}$.
3. $\log_a a^r = r$	7. $\log_a M^r = r \cdot \log_a M$
4. $a^{\log_a M} = M$	8. _______ $= \dfrac{\log_b M}{\log_b a}$

9. The compound interest formula for the accumulated amount of an investment is

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

Find the approximate and exact double time for an investment of \$500 at an APR of 3.5% compounded annually.

(a) Approximate (b) Exact

10. Write a few sentences describing something you learned that was new for you in class this unit. You may include a favorite activity, an interesting application, a teaching and learning technique, or a specific concept that you better understand as a result of this unit.

Do your best! Rise to the challenge! Live and learn!