Bishop's University

Math 196: Final Exam
Fall 2016

Name:	
Student #:	
Time:	180 minutes

- Prepare neat solutions. Briefly justify your work, that is, *make your reasoning clear.*
- All answers must be exact (no decimals allowed) unless specifically directed otherwise.
- All dollar values must be given to the nearest penny, unless otherwise indicated.
- Do not remove any pages from this test.
- The back of each page may be used for scrap paper.
- A **Casio fx260-solar** calculator is permitted. No other electronic calculators are permitted.

Useful Formulas

$$A = P\left(1 + \frac{r_n}{m}\right)^{mt}$$

$$r_e = \left(1 + \frac{r_n}{m}\right)^{m} - 1$$

$$S = R\left(\frac{\left(1 + \frac{r_n}{m}\right)^{mt} - 1}{\frac{r_n}{m}}\right)$$

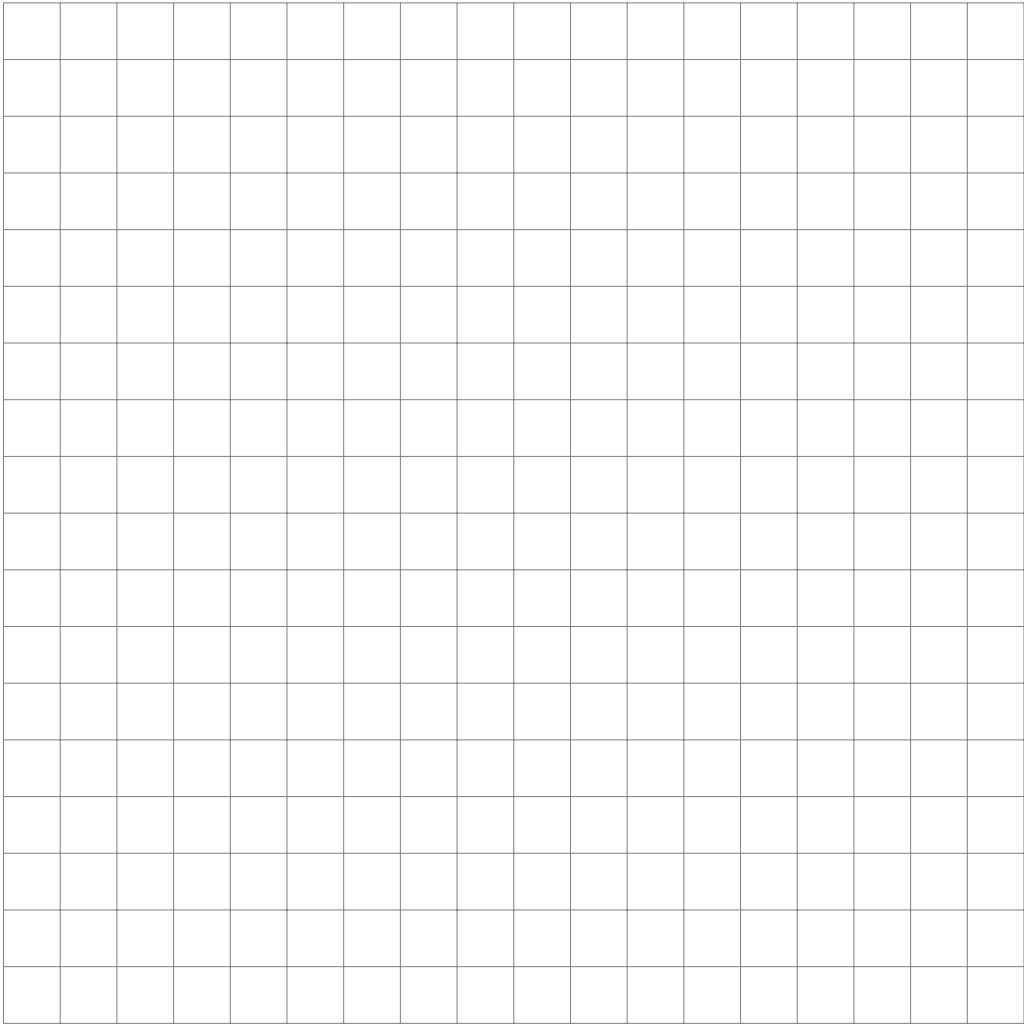$$P = R\left(\frac{1 - \left(1 + \frac{r_n}{m}\right)^{-mt}}{\frac{r_n}{m}}\right)$$

$$S = R\left(\frac{\left(1 + \frac{r_n}{m}\right)^{mt+1} - 1}{\frac{r_n}{m}} - 1\right)$$

$$P = R\left(\frac{1 - \left(1 + \frac{r_n}{m}\right)^{1-mt}}{\frac{r_n}{m}} + 1\right)$$

Page	Points	Score
2	15	
3	15	
4	15	
5	15	
6	15	
7	15	
Total:	90	

1. (10 points) Sketch the region described by these inequalities, remembering to shade the **EXCLUDED** regions. Proper scaling and placement of axes will be taken into account in the grading.

$$\begin{cases} 3x + 4y & \geq & 12 \\ 2x - 3y & \leq & -6 \\ 7x + 4y & \leq & 28 \\ 5x - 3y & \geq & -15 \end{cases}$$

2. (5 points) Solve the following inequality, $\left| \dfrac{3}{4}x - 4 \right| > \dfrac{13}{7}$, and write the solution using interval notation.

3. Evaluate, if possible,

   (a) (3 points) $\displaystyle\sum_{i=12}^{28} 7$

   (b) (3 points) $\displaystyle\sum_{k=1}^{30} k^2 + 3k - 5$

   (c) (4 points) $\displaystyle\sum_{n=1}^{\infty} 5\left(\frac{11}{10}\right)^{1-n}$

4. (5 points) Consider the recursive sequence given by $a_1 = 2$, $a_2 = 6$, and $a_k = \dfrac{a_{k-1}}{a_{k-2}}$ for $k \geq 3$. Find a_7.

5. (3 points) Find the effective rate that is equivalent to the nominal rate of 5.75%, compounded weekly. **Give the answer as a percentage with two decimal places.**

6. (3 points) What is the initial investment which give $16,275 after 13 years at a nominal rate of 4.27%, compounded daily?

7. (4 points) Find the amount in a savings account if $300 is deposited at the end of each month for 7 years. The savings account pays a nominal rate of 2%, compounded monthly, and has an opening balance of $0.

8. (5 points) A 25-year mortgage for $150,000 is granted to a new homeowner. The nominal interest rate is 3%, compounded monthly, with the payments made at the end of each month. How much is left owing on the mortgage after 10 years? **Hint: Compute the present value of the annuity for the remaining years.**

9. Let

$$A = \begin{bmatrix} 4 & -1 & 2 \\ 0 & 6 & 3 \end{bmatrix}, \quad B = \begin{bmatrix} -1 & 2 \\ 3 & -4 \\ -5 & 0 \end{bmatrix}, \quad C = \begin{bmatrix} 7 & -12 \\ -3 & 14 \end{bmatrix}, \quad D = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$$

Evaluate, if possible, the following. If not possible, give reasons.

(a) (5 points) $AB + C + 10I$.

(b) (5 points) $D(B^T + A)$.

10. (5 points) Find values x and y such that

$$x \begin{bmatrix} 3 \\ 2 \end{bmatrix} + y \begin{bmatrix} 2 \\ -1 \end{bmatrix} = \begin{bmatrix} 0 \\ 5 \end{bmatrix}$$

11. (4 points) In a horse race, a horse is said to *finish in the money* if it finishes in first, second, or third place. For an eight-horse race, in how many ways can the horses finish in the money? Assume no ties.

12. (3 points) How many distinguishable arrangements of all the letters in the word LENNOXVILLE are possible?

13. (3 points) A jelly bean is selected randomly from a bag which contains five red, nine white, and two green jelly beans. Find the probability that the jelly bean is white.

14. (5 points) A fair coin is tossed four times in a row. Find the probability of getting exactly two heads if the second toss is a tail.

15. At the beginning of a tournament, a certain curling team has a 75% probability of winning the first game. If the team win the first game, they have an 85% probability of winning the next game. If the team does not win the first game, they have a 55% probability of losing the next game. No ties are possible. **For this question, the answers are to be decimal numbers with four decimal places.**

(a) (8 points) Find the indicated probabilities. You may use the probability tree given below.

W2 $P(W1 \cap W2) =$

W1

L2 $P(W1 \cap L2) =$

W2 $P(L1 \cap W2) =$

L1

L2 $P(L1 \cap L2) =$
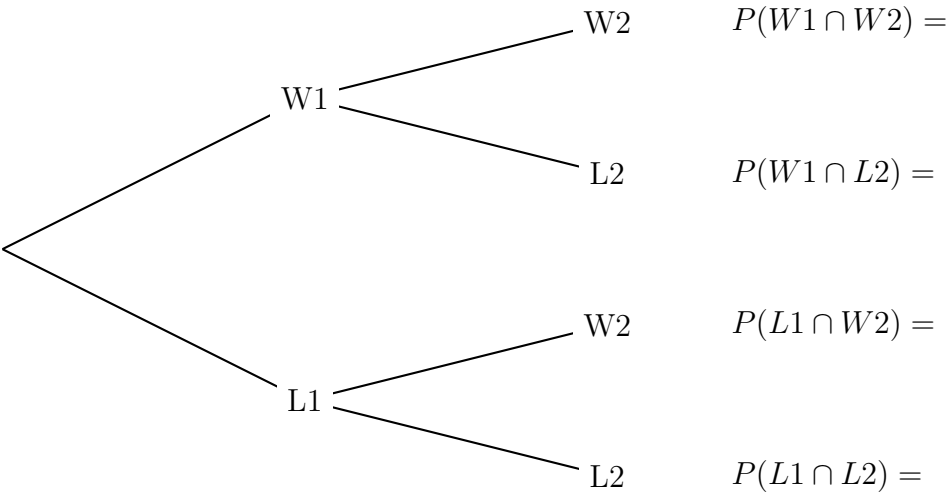
(b) (3 points) Find the probability that the team will lose the second game.

(c) (2 points) If the team won the second game, find the probability that they won the first game.

(d) (2 points) If the team lost the second game, find the probability that they lost the first game.