Bishop's University

Math 196: Final Exam
Fall 2012

Name: _____

Student #: _____

- This exam is 180 minutes in length.
- Do not remove any pages from this test.
- The back of each page may be used for scrap paper.
- 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.
- Prepare neat solutions. Briefly justify your work, that is, *make your reasoning clear.*

Useful Formulas

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

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

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

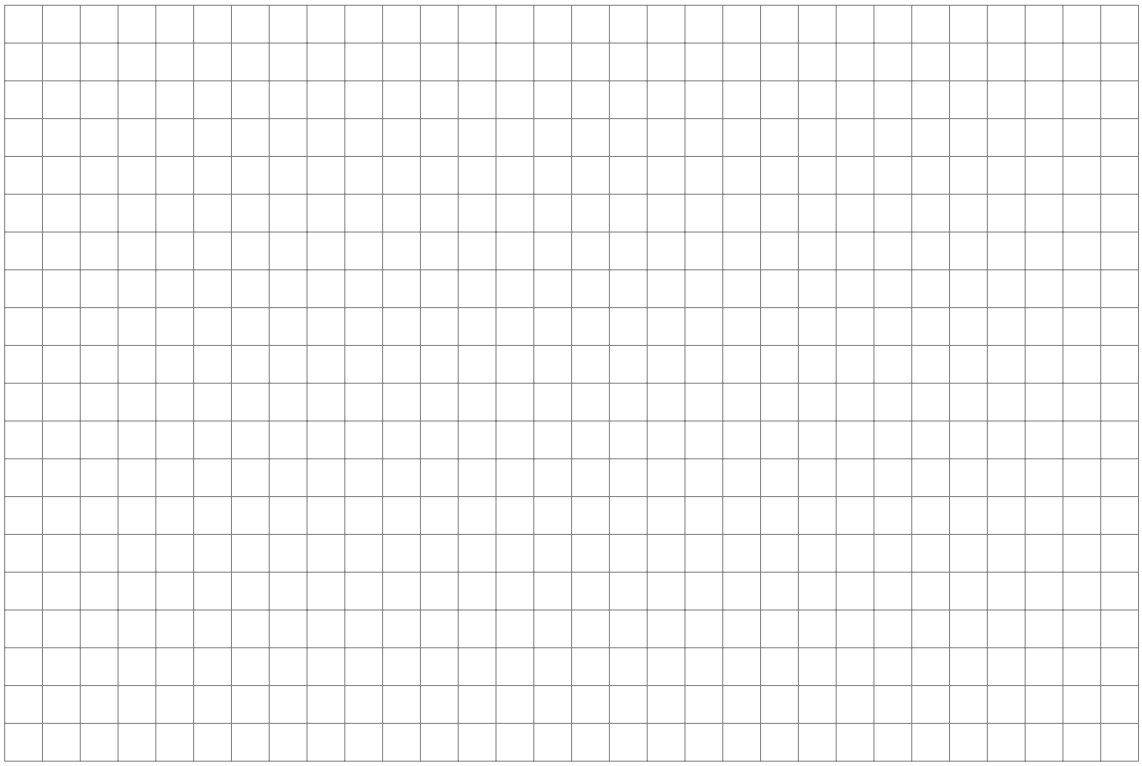
$$P = R\left(\frac{1 - \left(1 + \frac{r_n}{m}\right)^{-mt}}{\frac{r_n}{m}}\right)$$

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

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

Page	Points	Score
3	48	
4	14	
5	38	
Total:	100	

1. Solve the following inequalities, and write the solution set in interval notation.
   (a) (3 points) $3 - 2x > 5x - 11$
   (b) (4 points) $|-2x + 3| \leq 8$
2. (3 points) Express in summation notation: $1 + 8 + 15 + 22 + 29 + 36 + 43 + 50$
3. (3 points) Let $(a_k) = \left(\dfrac{(k+2)!}{k!}\right)$. Find a_{10}.
4. (4 points) Evaluate: $\displaystyle\sum_{i=10}^{50} i^2$
5. (4 points) Let $a_1 = 1$, $a_2 = 1$ and $a_{k+2} = \dfrac{1}{a_{k+1}} + a_k$. Find a_6.
6. Evaluate the following sums, if possible, or state why this cannot be done.
   (a) (4 points) $\displaystyle\sum_{i=1}^{10} \frac{1}{10} \cdot 3^i$
   (b) (4 points) $\displaystyle\sum_{i=1}^{\infty} \frac{5}{1.05^{i-1}}$
7. (5 points) A company invests a total of \$30,000 of surplus funds at two annual rates of interest: 5% and 6.75%. It wishes an annual yield of no less than 6.5%. What is the maximum amount of money that the company can invest at the 5% rate? Give your answer in dollars (no decimals) without going over the maximum amount.
8. Natalya and Samantha want to set up a lemonade stand. The lemonade cost 10 cents per glass to make and they are planning to sell the lemonade for 25 cents per glass. The cost of making the stand and sign was \$9.
   (a) (6 points) Find the linear equations for cost, revenue, and profit.
   (b) (3 points) Calculate the number of glasses of lemonade sold to break-even.
   (c) (5 points) Plot the cost and revenue functions, and indicate the break-even point.

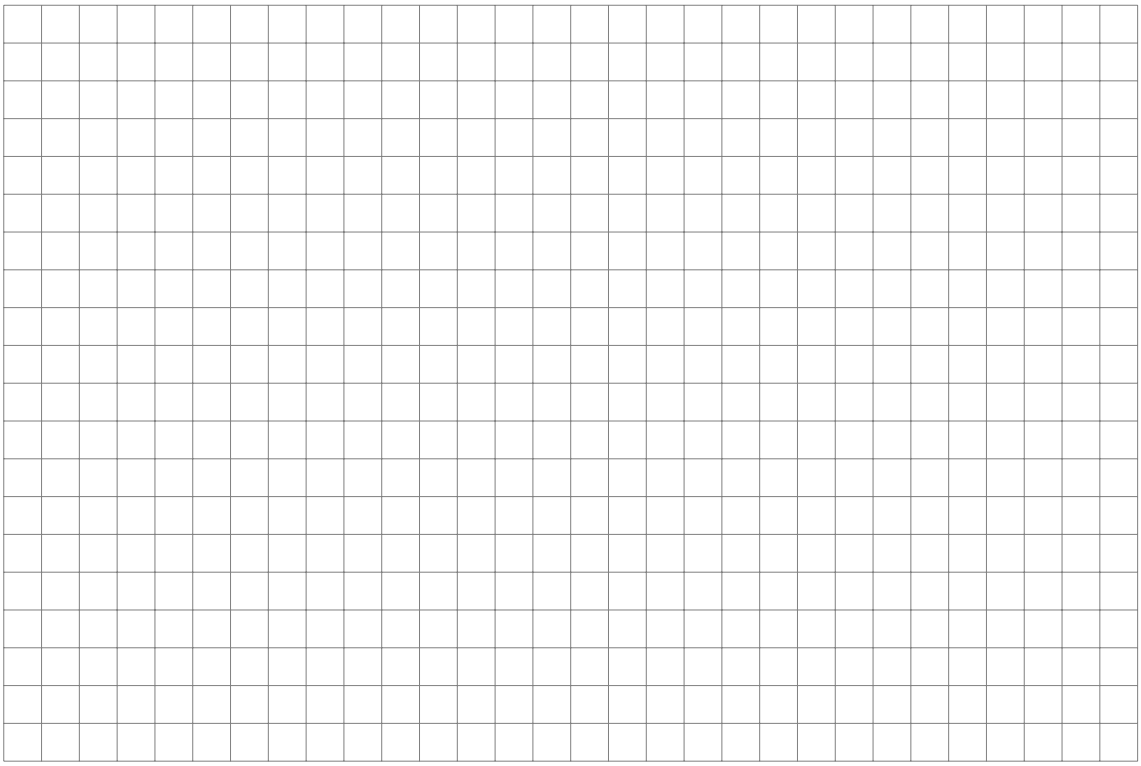


9. (4 points) Over the last 5 years, Bendy Mutual Fund grew at the rate of 10.45% compounded quarterly. Over the same period, Acme Mutual Fund grew at the rate of 10.60% compounded semi-annually. Which mutual fund had a better rate of return?

10. (4 points) Angie wants to plan a trip to Hawaii with her husband on their 10th wedding anniversary in two years. She anticipates that the all-inclusive trip will cost $9500 for both of them and wants to start saving. How much should she deposit at the end of each month into her account that pays 12% compounded monthly to pay for the trip in two years?

11. (6 points) Sketch the solution set for the system. Remember to shaded the **EXCLUDED** regions.

$$\begin{aligned} x &> 0 \\ y &> 0 \\ x + y &\leq 6 \\ 2x + y &\leq 8 \end{aligned}$$



12. (5 points) The total number of passangers riding a certain city bus during the morning shift is 1000. If the child's fare is \$2.00, the adult fare is \$2.75, and the total revenue from the fares in the morning is \$2,555.00, how many children and how many adults rode the bus during the morning shift?

13. Let

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

Find, if possible, the following matrices. If not possible, give reasons.

(a) (3 points) $AB + C + 10I$.

(b) (3 points) $D(B^T + C)$.

(c) (3 points) CD^{-1}.

14. (12 points) Use matrix reduction to solve

$$\begin{cases} x + 2y + 3z + 3w = 3 \\ 4x + 5y + 6z + 6w = -3 \\ 7x + 8y + 9z + 8w = 2 \end{cases}$$

15. Consider the matrix

$$A = \begin{bmatrix} 4 & -1 & 1 \\ 1 & 0 & -1 \\ -3 & 1 & -3 \end{bmatrix}$$

(a) (10 points) Find A^{-1}

(b) (2 points) Use the inverse to solve the following system of linear equations.

$$\begin{cases} 4x - y + z = 3 \\ x - z = 1 \\ -3x + y - 3z = -5 \end{cases}$$