Finite Math - Spring 2017

Final Review - 5/10/2017

Problem 1. *American General offers a* 7*-year ordinary annuity with a guaranteed rate of* 6.35% *compounded annually. How much should you pay for one of these annuities if you want to receive payments of* $\$10,000$ *annually over the* 7*-year period?* ($\$55,135.98$)

Problem 2. *If you buy a computer directly from the manufacturer for* $\$3,500$ *and agree to repay it in* 60 *equal installments at* 1.75% *interest per month of the unpaid balance, how much are your monthly payments? How much total interest will be paid?* ($\$94.69; \$2,181.40$)

Problem 3. *Grandparents deposited* $\$6,000$ *into a grandchild's account toward a college education. How much money (to the nearest dollar) will be in the account* 17 *years from now if the account earns* 7% *interest compounded monthly?* ($\$19,654$)

Problem 4. *A loan of* $\$2,500$ *was repaid at the end of* 10 *months with a check for* $\$2,812.50$. *What annual rate of interest was charged?* (15%)

Problem 5. *How long will it take money to double if it is invested at* 7% *compounded daily?* 8.2% *compounded continuously?* ($3,615$ *days;* 8.453 *years*)

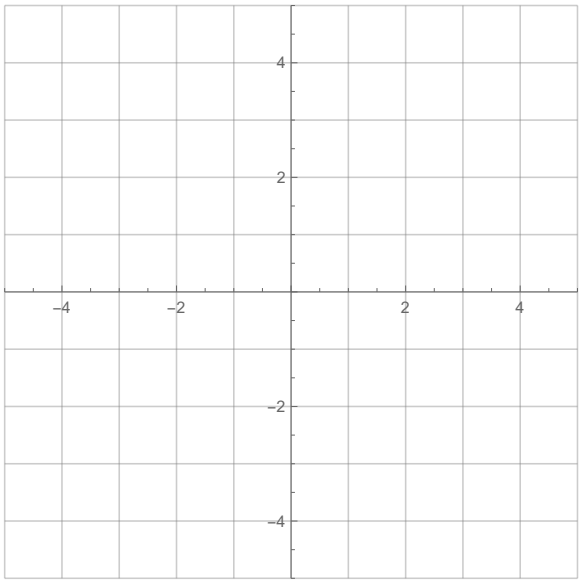
Problem 6. *If you invest* $\$5,650$ *in an account paying* 8.65% *compounded continuously, how much money will be in the account at the end of* 10 *years?* ($\$13,418.78$)

Problem 7. *Parents have set up a sinking fund in order to have* $\$120,000$ *in* 15 *years for their children's college education. How much should the paid semiannually into an account paying* 6.8% *compounded semiannually?* ($\$2,363.07$)

Problem 8. *Solve the following system by graphing:*

$$\begin{aligned} 2x - y &= 4 \\ x - 2y &= -4 \end{aligned}$$

$(x = 4, y = 4)$



Problem 9. *Solve the following system by Gauss-Jordan elimination:*

$$\begin{aligned} x + 2y + 3z &= 1 \\ 2x + 3y + 4z &= 3 \\ x + 2y + z &= 3 \end{aligned}$$

$(x = 2, y = 1, z = -1)$

Problem 10. *Solve the following system by Gauss-Jordan elimination:*

$$\begin{aligned} x + y + z &= 8 \\ 3x + 2y + 4z &= 21 \end{aligned}$$

$(x = -2t + 5, y = t + 3, z = t)$

Problem 11. *Solve the following system of equations:*

$$\begin{aligned} x - 2y &= 4 \\ x - 3y &= 2 \end{aligned}$$

$(x = 8, y = 2)$

Problem 12.

$$A = \begin{bmatrix} 2 & -2 \\ 1 & 0 \\ 3 & 2 \end{bmatrix}, B = \begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}, C = \begin{bmatrix} 2 & 1 & 3 \end{bmatrix}$$

$$D = \begin{bmatrix} 3 & -2 & 1 \\ -1 & 1 & 2 \end{bmatrix}, E = \begin{bmatrix} 3 & -4 \\ -1 & 0 \end{bmatrix}$$

Find the following matrices (if it is not possible, say why):
(a) $A + D$, (b) $E + DA$, (c) $DA - 3E$, (d) BC, (e) CB, (f) $AD - BC$

not defined; $\begin{bmatrix} 10 & -8 \\ 4 & 6 \end{bmatrix}$; $\begin{bmatrix} -2 & 8 \\ 8 & 6 \end{bmatrix}$; $\begin{bmatrix} -2 & -1 & -3 \\ 4 & 2 & 6 \\ 6 & 3 & 9 \end{bmatrix}$; $\begin{bmatrix} 9 \end{bmatrix}$; $\begin{bmatrix} 10 & -5 & 1 \\ -1 & -4 & -5 \\ 1 & -7 & -2 \end{bmatrix}$

Problem 13. *Find the inverse of*

$$A = \begin{bmatrix} 4 & 3 \\ 3 & 2 \end{bmatrix}.$$

$$\begin{bmatrix} -2 & 3 \\ 3 & -4 \end{bmatrix}$$

Problem 14. *Find the inverse of*

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 1 & 2 & 1 \end{bmatrix}.$$

$$\begin{bmatrix} -\frac{5}{2} & 2 & -\frac{1}{2} \\ 1 & -1 & 1 \\ \frac{1}{2} & 0 & -\frac{1}{2} \end{bmatrix}$$

Problem 15. *An economy is based on two industrial sectors, agriculture and fabrication. Production of a dollar's worth of agriculture requires an input of* \$0.30 *from the agriculture sector and* \$0.20 *from the fabrication sector. Production of a dollar's worth of fabrication requires* \$0.10 *from the agriculture sector and* \$0.40 *from the fabrication sector. Find the output for each sector that is needed to satisfy a final demand of* \$50 *billion for agriculture and* \$20 *billion for fabrication. (Agriculture:* \$80 *billion; fabrication:* \$60 *billion)*

Problem 16. *For $n \times n$ matrices A and B, and $n \times 1$ column matrices C, D, and X, solve the following matrix equations for X:*

(1) $AX - BX = C$

(2) $AX - X = C$

(3) $AX + C = BX + C$

Problem 17. *Solve the following system of equations:*

$$\begin{array}{rcrcl} x & + & 2y & = & k_1 \\ x & + & 3y & = & k_2 \end{array}$$

where

(1) $k_1 = 1, k_2 = 3$ $(x = -3, y = 2)$

(2) $k_1 = 3, k_2 = 5$ $(x = -1, y = 2)$

(3) $k_1 = -2, k_2 = 1$ $(x = -8, y = 3)$

Problem 18. *Maximize $P = 2x + 6y$ subject to*

$$\begin{array}{rcrcl} x & + & 2y & \leq & 8 \\ 2x & + & y & \leq & 10 \\ & & x, y & \geq & 0 \end{array}$$

(Max of 24 at $(0, 4)$.)

Problem 19. *Minimize $C = 5x + 2y$ subject to*

$$\begin{array}{rcrcl} x & + & 2y & \geq & 15 \\ 2x & + & y & \geq & 20 \\ & & x, y & \geq & 0 \end{array}$$

(Min of 40 at $(0, 20)$.)

Problem 20. *A dietitian is to arrange a special diet composed of two foods, M and N. Each ounce of food M contains 30 units of calcium, 10 units of iron, 10 units of vitamin A, and 8 units of cholesterol. Each ounce of food N contains 10 units of calcium, 10 units of iron, 30 units of vitamin A, and 4 units of cholesterol. If the minimum daily requirements are 360 units of calcium, 160 units of iron, and 240 units of vitamin A, how many ounces of each food should be used to meet the minimum requirements and at the same time minimize the cholesterol intake? What is the minimum cholesterol intake? (10 oz of food M and 6 oz of food N; 104 units of cholesterol)*