MATHEMATICS 1115 2007 FALL TEST 1

SECTION __________ NAME (PRINTED) ______________________________

Student Number _______________ SIGNATURE ______________________________

Only calculators without memory or graphics are allowed and no other electronic devices are allowed. **Each multiple choice question is worth 1 mark. All work is to be shown on the attached question paper in the space provided and** ***the answer selected must be X'd on this answer sheet.*** **Both the question paper and the answer sheet,** ***both*** **with completed identification sections, must be handed in.**

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1. Over a seven-year period \$1000 accumulated to \$1835 in an investment certificate in which interest was compounded monthly. The *monthly* rate of interest was:

(A) $\sqrt[7]{\frac{1835}{1000}}-1$ (B) $\sqrt[84]{\frac{1000}{1835}}-1$ (C) $\sqrt[7]{\frac{1835}{1000}}+1$ (D) $\sqrt[84]{\frac{1835}{1000}}-1$ (E) $\log(\frac{1000}{1835})-1$

An initial investment of \$25,000 in a business guarantees the following cash flows:

Year	Cash Flow
3	\$8,000
4	\$10,000
6	\$14,000

The interest available is 6% compounded semi-annually. *TWO* questions.

2. The net present value (NPV) of the cash flows is given by:

(A) $8000(1.03)^{-6} + 10,000(1.03)^{-8} + 14,000(1.03)^{-12} - 25,000$
(B) $8000(1.03)^{-6} + 10,000(1.03)^{-8} + 14,000(1.03)^{-12} + 25,000$
(C) $8000(1.03)^{6} + 10,000(1.03)^{8} + 14,000(1.03)^{12} - 25,000$
(D) $8000(1.06)^{-3} + 10,000(1.06)^{-4} + 14,000(1.06)^{-6} - 25,000$
(E) $8000(1.06)^{3} + 10,000(1.06)^{4} + 14,000(1.06)^{6} + 25,000$

3. The investment is:

(A) profitable, if the answer to question 3. is less than 0
(B) profitable, in any event
(C) profitable, if the answer to question 3. is less than -1
(D) unprofitable, if the answer to question 3. is less than 1
(E) unprofitable, if the answer to question 3. is less than 0

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4. The annual rate which when compounded *continuously* is rquivalent to a nominal rate of 6% componded semiannually is:

(A) $\ln(1.06)$ (B) $2\ln(1.03)$ (C) $\frac{1}{2}\ln(1.06)$ (D) 12% (E) $(\ln(1.03))^2$

Recall that

$$a_{\overline{n}|r} = \frac{1-(1+r)^{-n}}{r}$$

$$s_{\overline{n}|r} = \frac{(1+r)^{n}-1}{r}$$

5. The present value of an ordinary annuity given by \$1000 payments, every six months, for four years, at the rate of 10% compounded semi-annually is:

(A) $1000s_{\overline{8}|0.05}$ (B) $1000a_{\overline{8}|0.05}$ (C) $1000a_{\overline{4}|0.10}$ (D) $1000s_{\overline{4}|0.10}$ (E) $2(1000a_{\overline{4}|0.10})$

An automobile loan of \$8500 is to be ammortized over 48 months at an interest rate of 13.2% compounded monthly. *TWO* questions.

6. The monthly payment is:

(A) $\dfrac{8500}{s_{\overline{48}|0.011}}$ (B) $\dfrac{a_{\overline{48}|0.011}}{8500}$ (C) $\dfrac{s_{\overline{48}|0.011}}{8500}$ (D) $\dfrac{8500}{a_{\overline{48}|0.011}}$ (E) $\dfrac{8500}{48}(1.011)$

7. The finance charge (total interest paid) is:

(A) $48(\frac{8500}{a_{\overline{48}|0.011}})-8500$ (B) $48(\frac{8500}{s_{\overline{48}|0.011}})-8500$ (C) $48(\frac{8500}{a_{\overline{48}|0.011}})+8500$
(D) $48(\frac{a_{\overline{48}|0.011}}{8500})-8500$ (E) $48(\frac{8500}{s_{\overline{48}|0.011}})+8500$

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8. The solution or solutions of

$$\begin{bmatrix} 4 & 2 & 1 \\ 3x & y & 3z \\ 0 & w & 7 \end{bmatrix} = \begin{bmatrix} 4 & 2 & 1 \\ 6 & 7 & 9 \\ 0 & 9 & 8 \end{bmatrix} \qquad \text{are:}$$

(A) no solutions (B) $x = 2,\ y = 7,\ z = 3$ (C) $x = 2,\ y = 7,\ z = 3,\ w = 9$ (D) all real numbers (E) $x = 0,\ y = 0,\ z = 0,\ w = 0$

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9. $\begin{bmatrix} 1 & -1 \\ 0 & 3 \end{bmatrix} \begin{bmatrix} -1 & 0 & -1 & 0 & 0 \\ 2 & 1 & 2 & 1 & 1 \end{bmatrix} =$

(A) $\begin{bmatrix} 6 & 3 & 6 & 3 & 3 \\ -3 & -1 & -3 & -1 & -1 \end{bmatrix}$ (B) undefined (C) $\begin{bmatrix} -3 & -1 & -3 & -1 & -1 \\ 6 & 3 & 6 & 3 & 3 \end{bmatrix}$
(D) $\begin{bmatrix} -3 & -1 \\ 6 & 3 \end{bmatrix}$ (E) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

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10. $\begin{bmatrix} 2 & -3 \\ 0 & 1 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} =$

(A) undefined (B) $\begin{bmatrix} 2x_1 & -3x_2 \\ 0 & x_2 \\ 2x_1 & x_2 \end{bmatrix}$ (C) $\begin{bmatrix} 0 & x_2 \\ 2x_1 & x_2 \end{bmatrix}$ (D) $\begin{bmatrix} x_2 \\ 2x_1 + x_2 \end{bmatrix}$
(E) $\begin{bmatrix} 2x_1 - 3x_2 \\ x_2 \\ 2x_1 + x_2 \end{bmatrix}$

The next *THREE* questions concern the system $\begin{cases} x & & & + & 3z & = & -1 \\ 3x & + & 2y & + & 11z & = & 1 \\ x & + & y & + & 4z & = & 1 \\ 2x & - & 3y & + & 3z & = & -8 \end{cases}$

11. The augmented matrix of this system reduces to:

(A) $\left[\begin{array}{ccc|c} 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right]$ (B) $\left[\begin{array}{ccc|c} 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 0 \end{array}\right]$ (C) $\left[\begin{array}{ccc|c} 1 & 0 & 3 & -1 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right]$ (D) $\left[\begin{array}{ccc|c} 1 & 0 & 3 & -1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right]$
(E) none of these

12. The system has:

(A) infinitely many solutions (B) a unique solution (C) no solutions (D) three solutions
(E) four solutions

13. The solution[s] is [are]:

(A) $x = -1,\ y = 2,\ z = 0$ (B) $x = -1,\ y = 2,\ z = 0,\ w = 0$
(C) $x = -3r - 1,\ y = -r + 2,\ z = r$ for r any real number (E) none of these
(E) $x = -3r - 1,\ y = p,\ z = r$, for p and r any real numbers

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The next *TWO* questions concern the system $\begin{cases} 2x - 5y = 0 \\ 8x - 20y = 0 \end{cases}$

14. The augmented matrix of the system reduces to:

(A) $\left[\begin{array}{cc|c} 1 & 0 & 0 \\ 0 & 0 & 0 \end{array}\right]$ (B) $\left[\begin{array}{cc|c} 1 & 0 & 0 \\ 0 & 1 & 0 \end{array}\right]$ (C) $\left[\begin{array}{cc|c} 1 & -\frac{5}{2} & 0 \\ 0 & 0 & 0 \end{array}\right]$ (D) $\left[\begin{array}{cc|c} 1 & 0 & \frac{5}{2} \\ 0 & 0 & 0 \end{array}\right]$ (E)

15. The solution[s] is [are]:

(A) only the trivial solution (B) $x = \dfrac{5}{2}$, $y = 0$ (C) $x = \dfrac{5}{2}r$, $y = r$, for r any real number
(D) $x = 0$, $y = r$, for r any real number (E) none of these

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The next *TWO* questions concern the system $\begin{cases} w + x + 2y + 7z = 0 \\ w - 2x - y + z = 0 \\ w + 2x + 3y + 9z = 0 \\ 2w - 3x - y + 4z = 0 \end{cases}$

16. The augmented matrix of the system reduces to:

(A) none of these

(B) $\left[\begin{array}{cccc|c} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \end{array}\right]$ (C) $\left[\begin{array}{cccc|c} 1 & 0 & 1 & 5 & 0 \\ 0 & 1 & 1 & 2 & 0 \\ 0 & 0 & 1 & 2 & 0 \\ 0 & 0 & 0 & 1 & 0 \end{array}\right]$ (D) $\left[\begin{array}{cccc|c} 1 & 0 & 1 & 5 & 0 \\ 0 & 1 & 1 & 2 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{array}\right]$

(E) $\left[\begin{array}{cccc|c} 1 & 0 & 1 & 5 & 0 \\ 0 & 1 & 1 & 2 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right]$

17. From the reduced matrix we conclude that the system has:

(A) infinitely many solutions with one parameter (B) infinitely many solutions with two parameters
(C) only the trivial solution (D) no solutions (E) two solutions

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The agriculture, A, and milling, M, sectors of a very simple economy are related in the following way: To produce one unit of A requires 1/3 of a unit of A and 1/4 of a unit of M. To produce one unit of M requires 3/4 of a unit of A and no units of M. The next *TWO* questions are about this situation.

18. The coefficient matrix for the economy is:

(A) $\begin{bmatrix} 1/3 & 1/4 \\ 3/4 & 0 \end{bmatrix}$ (B) $\begin{bmatrix} -1/3 & 1/4 \\ 3/4 & 0 \end{bmatrix}$ (C) $\begin{bmatrix} 1/3 & -3/4 \\ -1/4 & 0 \end{bmatrix}$ (D) $\begin{bmatrix} 1/3 & 3/4 \\ 1/4 & 0 \end{bmatrix}$

(E) $\begin{bmatrix} -1/3 & 3/4 \\ 1/4 & 0 \end{bmatrix}$

19. There is an external demand for 300 units of agriculture and 500 units of milled products. To find the production needed to satisfy this demand,

reduce the matix:

(A) $\left[\begin{array}{rr|r} 2/3 & -1/4 & 300 \\ -3/4 & 1 & 500 \end{array}\right]$ (B) $\left[\begin{array}{rr|r} 1/3 & 3/4 & 300 \\ 1/4 & 1 & 500 \end{array}\right]$ (C) $\left[\begin{array}{rr|r} 1/3 & 1/4 & 300 \\ 3/4 & 1 & 500 \end{array}\right]$

(D) $\left[\begin{array}{rr|r} 2/3 & -3/4 & 300 \\ -1/4 & 1 & 500 \end{array}\right]$ (E) $\left[\begin{array}{rr|r} 2/3 & 3/4 & 300 \\ 1/4 & 1 & 500 \end{array}\right]$

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20. The number of corner points of the region defined by the points which satisfy $\begin{cases} -2x + 5y \leq 10 \\ 4x - 6y \leq 12 \\ y \geq 0 \end{cases}$ is:

(A) 4 (B) 3 (C) 5 (D) 2 (E) 6

A manufacturer produces two types of DVD player: Vista and Xtreme. During production, each Vista requires 1 hour on Machine A and 2 hours on Machine B while each Xtreme requires 3 hours on Machine A and 2 hours on Machine B. Each machine is available for 24 hours a day. The company makes a profit of \$50 on each Vista and \$80 on each Xtreme. The company would like to determine x, the daily production of Vistas, and y, the daily production of Xtremes which will optimize their profit P. The next *THREE* questions concern this situation.

21. The linear programming problem requires us to:

    (A) Maximize $P = -50x - 80y$ (B) Minimize $P = -50x - 80y$ (C) Minimize $P = 50x + 80y$ (D) Maximize $P = 80x + 50y$ (E) Maximize $P = 50x + 80y$

22. The feasible region for the manufacturer's problem is:

    (A) $\begin{cases} x + 2y \le 24 \\ 3x + 2y \le 24 \\ x \ , \ y \ge 0 \end{cases}$ (B) $\begin{cases} x + 3y \le 24 \\ 2x + 2y \le 24 \\ x \ , \ y \ge 0 \end{cases}$ (C) $\begin{cases} x + 3y \le 50 \\ 2x + 2y \le 80 \\ x \ , \ y \ge 0 \end{cases}$

    (D) $\begin{cases} x + 3y \le 24 \\ 2x + 2y \le 24 \\ 50x + 8y = P \end{cases}$ (E) none of these

23. The number of corner points of the feasible region is:

    (A) 3 (B) 5 (C) 6 (D) 2 (E) 4

The last *TWO* questions concern the problem

$$\text{Maximize} \quad P = 6x + 8y + 12z$$

Subject to

$$\begin{aligned} x + 2y + 3z &\leq 900 \\ 4x + 4y + 8z &\leq 5000 \\ x, y &\geq 0 \end{aligned}$$

In the space provided, construct the Initial Simplex Table, using s for the first slack variable and t for the second (keeping the constraints in the order given here) and answer the following questions.

24. The pivot column is labelled:

    (A) z (B) x (C) y (D) t (E) s

25. The pivot row is labelled:

    (A) x (B) t (C) z (D) s (E) P