Spring 2017

MA 262 - EXAM 1

GREEN - Test Version 01

Instructions

1. Fill in your scantron with your `NAME, PUID, Section Number` (4 digits), and the correct `Test Version` (GREEN is 01).
2. This exam contains 11 problems (9 points each) with 1 free point for a total of 100 points.
3. Do all your work only in the spaces provided or on the backside of the pages. Show your work.
4. Mark your answers clearly on your scantron. In addition, also **CIRCLE** your answer choice for each problem in this exam booklet in case your scantron is lost.
5. NO books, notes, calculators, phones, or cameras are allowed on this exam. Turn off and put away all electronic devices.

Academic Dishonesty

- *Students taking this exam are not allowed to seek or obtain any kind of help from anyone to answer questions on this exam. If you have questions, consult only your instructor.*
- *You are not allowed to look at the exam of another student. You may not compare answers with anyone else or consult another student until after you have finished your exam, handed it in to your instructor and left the room.*
- *You may not consult notes, books, calculators, phones, or cameras until after you have finished your exam, handed it in to your instructor and left the room.*
- *Anyone who violates these instructions will have committed an act of academic dishonesty. Penalties for academic dishonesty can be very severe. All cases of academic dishonesty will be reported to the Office of the Dean of Students.*

I have read and understand the above statements regarding academic dishonesty:

STUDENT NAME ______________________________

STUDENT PUID # ______________________________

STUDENT SIGNATURE ______________________________

SECTION #__________________ **Recitation INSTRUCTOR** __________________

Sect #	Time	Recitation Instructor
0153	8:30am	Sokurski
0171	9:30am	Sokurski
0260	9:30am	Cooper
0284	10:30am	Cooper
0306	4:30pm	Zhang
0339	3:30pm	Zhang
0420	11:30am	Ponce
0464	12:30pm	Ponce

Sect #	Time	Recitation Instructor
0525	3:30pm	Parab
0570	4:30pm	Parab
0612	2:30pm	Liu
0636	1:30pm	Liu
0707	1:30pm	Solapurkar
0721	2:30pm	Solapurkar

1. Find the general solution of the differential equation $\dfrac{dy}{dx} = \dfrac{x^2}{y(1+x^3)}$, where $x \neq -1, y \neq 0$.

A. $3y^2 - 2\ln|1+x^2| = C$

B. $3y^2 - 2\ln|1+x^3| = C$

C. $3y^2 - 2\ln|1+x| = C$

D. $2y^2 - 3\ln|1+x^3| = C$

E. $2y^2 - 3\ln|1+x| = C$

2. Find the solution of the initial value problem $\begin{cases} y' + \dfrac{2}{x}y = 4x \\ y(1) = 2 \end{cases}$.

A. $y = \dfrac{3-x^4}{x^2}$

B. $y = \dfrac{x^2+1}{x^4}$

C. $y = \dfrac{3x^4-1}{x^2}$

D. $y = \dfrac{3x^2-1}{x^4}$

E. $y = \dfrac{x^4+1}{x^2}$

3. A glass of water whose temperature T is 40°F is taken outside at noon on a day whose temperature T_m is a constant 60°F. Given that $T = T(t)$ satisfies the differential equation

$$\frac{dT}{dt} = -k\,(T - T_m)$$

and given that the water's temperature is 45°F at 2pm, the value of k is

A. $k = -\frac{1}{2} \ln\left(\frac{3}{4}\right)$

B. $k = -\frac{1}{3} \ln\left(\frac{3}{4}\right)$

C. $k = -\frac{1}{4} \ln\left(\frac{3}{2}\right)$

D. $k = -\ln\left(\frac{3}{4}\right)$

E. $k = \frac{1}{2}$

4. Find the general solution to the differential equation

$$y\,dx + (e^{-y} + x)\,dy = 0.$$

A. $xy - ye^{-y} = C$

B. $xy + e^{-y} = C$

C. $xy - e^{-y} = C$

D. $xy + e^{-xy} = C$

E. $xy - \ln(y) = C$

5. The solution to the differential equation $\dfrac{dy}{dx} = \dfrac{x^3 + 4y^3}{3xy^2} \quad (x > 0)$

is defined implicitly by which equation?

A. $x^3 + y^3 - Cxy^3 = 0$

B. $(x + y)^3 - Cx = 0$

C. $x^3 + y^3 - Cx^4 = 0$

D. $x + y - Cx^2 = 0$

E. $1 + y^3 - Cx = 0$

6. After an appropriate substitution, the Bernoulli equation $y\,' - \dfrac{3}{2x}\,y = 6y^{\frac{1}{3}}\,x^2 \ln x$

becomes

A. $u' - \dfrac{3}{2x}\,u = 4x^2 \ln x$

B. $u' - \dfrac{1}{x}\,u = 4x^2 \ln x$

C. $u' - \dfrac{3}{2x}\,u = 6x^2 \ln x$

D. $u' - \dfrac{1}{x}\,u = 6x^2 \ln x$

E. $u' + \dfrac{1}{2x}\,u = 4x^2 \ln x$

7. Which of the following statement(s) is/are always **TRUE** ?

(I) *The homogeneous system* $\begin{bmatrix} 1 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$ *has only two free variables.*

(II) *If* $A = \begin{bmatrix} 1 & 1 & -3 & 0 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix}$, *then* $\mathsf{rank}\,(A) = 2$.

(III) *If* A *is any* $m \times n$ *matrix, then* $(AA^T)^T = AA^T$.

A. Only (I)

B. Only (I) and (III)

C. Only (II) and (III)

D. Only (III)

E. All three are TRUE

8. Determine all the values of a for which the linear system has infinitely many solutions.

$$\begin{aligned} x_1 + 3x_2 - x_3 &= 1 \\ 3x_1 + 10x_2 + 5x_3 &= 1 \\ x_1 + 2x_2 - a^2 x_3 &= a \end{aligned}$$

A. $a = -3$

B. $a = 0$

C. $a = 1$

D. $a = 3$

E. $a = 4$

9. Let $A = \begin{bmatrix} 1 & -1 & 0 \\ -2 & 3 & -3 \\ 1 & -1 & 1 \end{bmatrix}$, then the sum of the three entries in the *third* column of A^{-1} is

A. 7

B. 4

C. 2

D. -1

E. -4

10. If A and B are 5×5 matrices such that $\det(A) = 3$ and $\det(B) = 8$, then $\det(-2AB^{-1}) =$

A. -48

B. -24

C. -12

D. $-\frac{3}{4}$

E. $\frac{3}{4}$

11. For what value of x is the matrix $\begin{bmatrix} 2 & x^2 & x & x \\ 0 & 1 & x & 0 \\ 0 & -1 & 2x & 2 \\ 0 & 0 & -1 & 1 \end{bmatrix}$ not invertible ?

A. $x = -\frac{2}{3}$

B. $x = -\frac{1}{2}$

C. $x = 0$

D. $x = \frac{3}{4}$

E. $x = 1$