

**MA262 — EXAM I — FALL 2019 — OCTOBER 1, 2019**  
**TEST NUMBER 11 — GREEN**

**INSTRUCTIONS:**

1. Do not open the exam booklet until you are instructed to do so.
2. Before you open the booklet fill in the information below and use a # 2 pencil to fill in the required information on the scantron.
3. *Mark your test number on your scantron*
4. Once you are allowed to open the exam, make sure you have a complete test. There are 7 different test pages including this cover page.
5. Do any necessary work for each problem on the space provided or on the back of the pages of this test booklet. Circle your answers on this test booklet.
6. The exam has 11 problems and each one is worth 9 points and everyone gets one point. The maximum possible score is 100 points. No partial credit.
7. Do not leave the exam room during the first 20 minutes of the exam.
8. If you do not finish your exam in the first 40 minutes, you must wait until the end of the exam period to leave the room.
9. After you have finished the exam, hand in your scantron and your test booklet to your recitation instructor.

**DON'T BE A CHEATER:**

1. Do not give, seek or obtain any kind of help from anyone to answer questions on this exam. If you have doubts, consult only your instructor.
2. Do not look at the exam or scantron of another student.
3. Do not allow other students to look at your exam or your scantron.
4. You may not compare answers with anyone else or consult another student until after you have finished your exam, given it to your instructor and left the room.
5. Do not consult notes or books.
6. Do not handle phones or cameras, calculators or any electronic device until after you have finished your exam, given it to your instructor and left the room.
7. After time is called, the students have to put down all writing instruments and remain in their seats, while the TAs collect the scantrons and the exams.
8. Anyone who violates these instructions will have committed an act of academic dishonesty. Penalties for academic dishonesty include an F in the course. 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 SIGNATURE: \_\_\_\_\_

STUDENT ID NUMBER: \_\_\_\_\_

SECTION NUMBER AND RECITATION INSTRUCTOR: \_\_\_\_\_

1. Solve the initial value problem  $\frac{dy}{dx} = \frac{2x(y-1)}{x^2+3}$ ,  $y(1) = 9$ .

A.  $y = 2x + 7$

B.  $y = 2x^2 + 7$

C.  $y = x^2 + 8$

D.  $y = -x^2 + 10$

E.  $y = -2x^2 + 11$

2. The general solution of  $\frac{dy}{dx} = \frac{x^2 + 3y^2}{2xy}$  is

A.  $y - x = Cx(y - 2x)^2$

B.  $(3y - 2x)^2 = C + x^3$

C.  $x^2 + y^2 = Cx^3$

D.  $x^2 - y^2 = Cx^3$

E.  $(3y - 2x)^2 = C + y$

3. A tank originally contains 100 gal of water with a salt concentration of  $1/2$  lb/gal. A solution containing a salt concentration of 2 lb/gal enters at a rate of 2 gal/min. and the well-stirred mixture is pumped out at the rate of 1 gal/min. Then, the amount of salt in the tank after 50 min is

A. 0 lb

B.  $400 - 350e^{-.5}$  lb

C.  $-e^2$  lb

D. 100 lb

E. 200 lb

4. Solve the differential equation  $\frac{dy}{dx} - \frac{2}{x}y = x^2 - 1$ ,  $x > 0$ .

A.  $y = x^2 + x + C$

B.  $y = x^3 - x + Cx^2$

C.  $y = x^2 + Cx$

D.  $y = -x^3 + x + Cx^2$

E.  $y = x^3 + x + Cx^2$

5. Which of the following is the implicit solution to the initial value problem

$$(e^x \sin y - 2y \sin x - 1) + (e^x \cos y + 2 \cos x + 3) \frac{dy}{dx} = 0, \quad y(0) = \pi ?$$

- A.  $e^x \sin y + 2y \cos x + 3x - y = \pi$
- B.  $e^x \cos y - 2y \cos x - x + 3y = \pi$
- C.  $e^x \sin y + 2y \cos x + 3y - x = 5\pi$
- D.  $e^x \cos y + 2 \sin x + 3x - y = -1 - \pi$
- E.  $e^x \sin y - 2y \cos x - x + 3y = \pi$

6. Find the general solution of the Bernoulli equation  $y' + 2x^{-1}y = 6x^4y^2$ .

- A.  $y = -2x^5 + Cx^2$
- B.  $y = \frac{1}{-2x^5 + Cx^2}$
- C.  $y = \frac{1}{2x^5 + Cx^2}$
- D.  $y = 2x^5 + Cx^2$
- E.  $y = \frac{1}{-x^5 + Cx^2}$

7. Consider the system

$$\begin{aligned}x_1 + x_2 + x_3 &= 2, \\2x_1 + 3x_2 + 2x_3 &= 5, \\2x_1 + 3x_2 + (k^2 - 2)x_3 &= k + 3.\end{aligned}$$

Determine all the values of the constant  $k$  for which the above system has no solution.

- A.  $k = -2$
- B.  $k = 2$
- C.  $k \neq -2$
- D.  $k \neq 2$
- E.  $k$  could be any real number.

8. If  $A = \begin{bmatrix} 1 & x \\ y & 2 \end{bmatrix}$ , find all the values of  $x$  and  $y$  for which  $AA^T = \begin{bmatrix} 2 & 4 \\ 4 & 8 \end{bmatrix}$ .

- A.  $x = 2, \quad y = 2$
- B.  $x = 1, \quad y = 1$
- C.  $x = 2, \quad y = 1$
- D.  $x = 1, \quad y = 2$
- E.  $x = \pm 1, \quad y = \pm 2$

9. The largest open interval on which the solution to the initial value problem

$$(\cos t) y' + \frac{t}{t-4} y = \ln(5-t); \quad y(2) = 0$$

is guaranteed by the Existence and Uniqueness Theorem to exist is

- A.  $\frac{\pi}{2} < t < 4$
  - B.  $0 < t < \pi$
  - C.  $4 < t < 5$
  - D.  $-\frac{\pi}{2} < t < \frac{\pi}{2}$
  - E.  $5 < t < \infty$
10. An object with initial temperature 32F is placed in a refrigerator whose temperature is a constant 0F. An hour later the temperature of the object is 16F. What will its temperature be four hours after it is placed in the refrigerator? Hint: Newton's law of cooling  $\frac{dT}{dt} = -k(T - T_m)$ .
- A. 1 F
  - B. 2 F
  - C. 3 F
  - D. 4 F
  - E. 5 F

11. For what value of  $k$  is the vector  $(2, 2, 1, 1)$  in the span of  $(1, 2, 1, -1)$  and  $(3, 2, 1, k)$ ?

A.  $-1$

B.  $0$

C.  $1$

D.  $2$

E.  $3$