

Name: _____

Math 10B: Mock Mid II

April 13, 2016

1. (2 + 2 + 2 + 2 + 2 points) State, with justification, whether the following statements are true or false.
- (a) If a 3×3 matrix A satisfies $A^3 + A = 0$, then it cannot be invertible.
 - (b) A computed 95% confidence interval for a population parameter has a 95% probability of containing the true value of the parameter.
 - (c) If the product of two matrices A and B is the identity matrix, then A and B are inverses of one another.
 - (d) The population standard deviation is never larger than the sample standard deviation.
 - (e) If the product of two matrices A and B is the zero matrix, then at least one of A and B is not invertible.
 - (f) The matrix $A = \begin{pmatrix} t & 2t-1 \\ -1 & -t \end{pmatrix}$ is invertible for all real values of t .

2. (4 + 6 points) Find the general solutions of the following differential equations.

(a) $y''(t) + 8y'(t) + 16y(t) = 0.$

(b) $(t + 2)^2y'(t) - ty(t)^2 = t.$

3. (3 + 2 + 4 points) In a random sample of 200 individuals, the handedness and eye-color was noted. The results are displayed below.

	Left	Right
Blue	18	62
Brown	22	98

- (a) From the results above, construct a 95% confidence interval for the proportion of left-handed individuals.
- (b) Construct a table showing the expected frequencies under the null hypothesis H_0 that handedness and eye-color are independent.
- (c) Explain how to use the tables of observed and expected frequencies to carry out a χ^2 test. Under what circumstances will we reject the null hypothesis?

4. (7 points) A fair dice is rolled ten times. Find the expected number of times an even number is followed by an odd number.

5. (4 + 2 + 6 points) A can is placed in a refrigerator. The can is initially at 33°C while the refrigerator's temperature is held constant at 3°C.

- (a) Let T_n be the temperature of the can n minutes after it was refrigerated. Assume that the T_n 's obey

$$T_{n+1} = 0.98T_n + 0.06$$

for $n \geq 0$. Find the temperature after two hours.

- (b) Write a differential equation for the can's temperature, assuming that its rate of change is proportional to its difference from that of the refrigerator,

- (c) After an hour inside, the can's temperature is down to 13°C. Solve the equation from (b) to find the temperature after two hours.