NAME	e-mail	TA name	disc. day/hour

GRADING
1.
2.
3.
4.
5.
TOTAL

Math 320 Fall 2017 Practice Final Exam

Exam time: 2 HOURS

Directions:

Do all the work on these pages; use reverse side if needed.

For the True/False questions, no justification is necessary and no partial credit will be given. For the remaining questions, you must show all the details of your work in order to receive credit.

No books, notes, calculators, phones, tablets, etc., and please **write legibly**.

Problem 1. Determine if the following statements are true or false, and **circle "True" or "False"** for an answer. *No justification is necessary.* (No partial credit.)

a) (10 points). The set V of all those vectors (x, y, z) in $\mathbb{R}^3$ whose components satisfy $z = x^2 + y^3$ is a subspace.

TRUE FALSE

b) (10 points). Two non-zero functions $f(x)$ and $g(x)$ are linear dependent if there exists a non-zero constant c such that $f(x) = cg(x)$ for some x.

TRUE FALSE

c) (10 points). If A and B are square matrices, then $\det(AB) = \det(A) \cdot \det(B)$.

TRUE FALSE

d) (10 points). Linearly independent vectors in $\mathbb{R}^n$ are pairwise orthogonal.

TRUE FALSE

e) (10 points). If A is a 3×3 matrix such that the system $A\underline{x} = \underline{0}$ has only the trivial solution, then the system $A\underline{x} = \underline{b}$ has a solution for every $\underline{b}$ in $\mathbb{R}^3$.

TRUE FALSE

f) (10 points). Let A and B be $n \times n$ matrices, and suppose that $\text{rank}(AB) = n$. Then A is invertible.

TRUE FALSE

g) (10 points). If W is a subspace of V and $\mathcal{B}$ is a basis for V, then some subset of $\mathcal{B}$ is a basis for W.

TRUE FALSE

h) (10 points). Suppose a matrix A is row equivalent to echelon matrix E. Then non-zero rows of E form a basis of $\text{Row}(A)$.

TRUE FALSE

i) (10 points). Let y_1 and y_2 be two different solutions of 2nd order differential equation $2y'' + 3y' + y = 0$. Then any solution of $2y'' + 3y' + y = 0$ is $c_1 y_1 + c_2 y_2$ for some constants c_1 and c_2.

TRUE FALSE

j) (10 points). If v_1 and v_2 are eigenvectors for the matrix A, then $v_1 + v_2$ is also an eigenvector of A.

TRUE FALSE

Problem 2.(25 points). Solve the following differential equations:

a) (10 points). $\dfrac{dy}{dx} = 3\sqrt{xy}$.

b) (15 points). $\dfrac{dy}{dx} = (1 - y)\cos x,\ \ y(\pi) = 2$.

Problem 3.(25 points).

a) (10 points) Find the general solution $y = y(x)$ of $y^{(4)} + 4y'' + 4y = 0$.

a) (10 points) Find a particular solution for $y'' + 4y = 3\cos(x) - 4x$.

b) (5 points) Find a linear homogeneous differential equation whose general solution is given by $y(x) = c_1 + c_2 e^{-3x} + c_3 e^{x}$.

Problem 4.(25 points). Find the general solution for the linear system of differential equations given by:

$$\begin{cases} x_1' = 5x_1 + 7x_2 \\ x_2' = -2x_1 - 4x_2 \end{cases}$$

Problem 5.(25 points). Let V be the subspace of $\mathbb{R}^5$ spanned by the vectors $v_1 = (1, 2, 3, 1, 3)$, $v_2 = (1, 3, 4, 3, 6)$ and $v_3 = (2, 2, 4, 3, 5)$. Find a basis for the orthogonal complement $V^\perp$ of V.