April 7, 1997 Math 262 Exam 2 Name ____________________

(10) **1.** The vectors $(1,2,1),\ (3,4,5),\ (2,0,k)$ are linearly **dependent** if

A. $k=1$

B. $k=6$

C. $k\neq 6$

D. $k=0$

E. $k\neq 0$

(10) **2.** If $T\colon P_3 \to P_3$ is a linear transformation such that $T(x^2-1)=x^2+x-3,\ T(3x)=6x$ and $T(2x+1)=4x+4$, then $T(x^2)$ is

A. x^2

B. x^2+x-2

C. x^2+x-1

D. x^2+x

E. x^2+x+1

(10) **3.** Use *Cramer's Rule* to solve the system below for the unknown functions $u_1(x)$ and $u_2(x)$.

$$u_1 \sin x + u_2 \cos x = 0$$
$$u_1 \cos x - u_2 \sin x = e^x$$

(10) **4.** What is the correct *form* of y_p to use when finding a particular solution to the equation $y'' + y = x \cos x$ using the method of undetermined coefficients?
Do not compute the coefficients. Just write down the **FORM** of the particular solution. (For example, if the right hand side were x^2, the correct form of y_p would be $Ax^2 + Bx + C$.)

(20) **5.** Let

$$A = \begin{bmatrix} 1 & 1 & -2 \\ 0 & 1 & a \\ 2 & 4 & -3 \end{bmatrix}$$

a) for what value(s) of a is $\det A \neq 0$.

b) Find all a such that the equation $Ax = 0$ has a nontrivial solution.

(20) **6.** Find the general solution $y(x)$ to the differential equation

$$y'' + 3y' + 2y = 10 \sin x.$$

(20) **7.** Let $T\colon R^4 \to R^3$ be defined by $Tx = Ax$ where

$$A = \begin{bmatrix} 1 & 1 & -1 & -3 \\ 0 & 1 & 1 & -4 \\ 2 & 2 & -2 & -6 \end{bmatrix}.$$

Find a basis for $\ker(T)$. What is the dimension of $\ker(T)$?