

Answer key for MATH1300 final exam, fall 2006

1. a) a not equal to 0 and a not equal to $3/2$ (1 parameter) b) $a=0$ (1 parameter) and $a=3/2$ (1 parameter)
c) never a unique solution

2. $x_3 = -3$

3. a) $a=15, b=2$, b) $A^{-1} = \frac{1}{10} \begin{bmatrix} -8 & 6 & 2 & 2 \\ 15 & 0 & -10 & 0 \\ 5 & 0 & 0 & 0 \\ 8 & 4 & -2 & -2 \end{bmatrix}$

4. a) area = $2\sqrt{3}$, b) $(0, 1, 1)$

5. 45

6. a) $x=-1+2t, y=1, z=-1-3t$, b) $(-3, 1, 2)$, c) $\frac{3}{\sqrt{13}}$.

7. a) linearly independent, b) not orthogonal, c) $k = \frac{1}{\sqrt{14}}$, or $k = \frac{-1}{\sqrt{14}}$.

8. a) linearly independent, b) no, c) no, d) no.

9. a) no, b) yes, c) yes.

10. a) basis of row space is $\{(1,0,0,0,0), (0,1,0,0,0), (0,0,1,0,0), (0,0,0,1,0), (0,0,0,0,1)\}$,
dimension of row space is 5, null space is $\{\mathbf{0}\}$, dimension of null space is 0.

b) basis for row space is $\{(1, -1, 0, 3, 0), (0, 0, 1, 2, 0), (0, 0, 0, 0, 1)\}$, dimension is 3,
basis for null space is $\{(1, 1, 0, 0, 0), (-3, 0, -2, 1, 0)\}$, dimension is 2.

Dimension of column space is 3.