Question	1	2	3	4	5	6	7	8	9	10
Answer	c	b	d	a	b	d	c	c	a	b

$$\begin{bmatrix} 1 & -3 & \vert & 1 \\ -2 & 8 & \vert & 2 \end{bmatrix} \quad 2R_1+R_2 \quad \begin{bmatrix} 1 & -3 & \vert \\ 0 & 2 & \vert \end{bmatrix} \quad \tfrac{1}{2}R_2 \quad \begin{bmatrix} 1 & -3 & \vert \\ 0 & 1 & \vert \end{bmatrix} \quad 3R_2+R_1 \quad \begin{bmatrix} 1 & 0 & \vert \\ 0 & 1 & \vert \end{bmatrix}$$

Choose the correct answer (write it in the table above):

1) The coordinate vector of $w = (1,2)$ relative to the basis $S = \{(1,-2),(-3,8)\}$ of $\mathbb{R}^2$ is

(a) $(w)_S = (-2,6)$	(b) $(w)_S = (-5,14)$	(c) $(w)_S = (7,2)$	(d) $(w)_S = (0,0)$

2) If $S = \{1+x, 1+x^2, x+x^2\}$ is a basis for $\mathcal{P}_2$ and the coordinate vector of $p(x) \in \mathcal{P}_2$ is $(p(x))_S = (2,-1,-2)$, then $p(x)$ is

$2(1+x)+(-1)(1+x^2)+(-2)(x+x^2)$
$= 2+\cancel{2x}-1-x^2-\cancel{2x}-2x^2$
$= -3x^2+1$

(a) $x+3x^2$	(b) $1-3x^2$	(c) $2+2x+2x^2$	(d) $1-2x^2$

*3) If $u = (-1, a, 2)$, $v = (2,3,-2)$ and $w = (4,0,0)$, then the set $\{u,v,w\}$ is linearly independent if and only if

$-3x-1$

(a) $a \neq 3$	(b) $a = 3$	(c) $a = -3$	(d) $a \neq -3$

4) The vector space $\mathbb{R}^2$ is spanned by

(a) $\{(-1,0),(2,4)\}$	(b) $\{(-1,-1),(\sqrt{2},\sqrt{2})\}$	(c) $\{(2,1)\}$	(d) $\{(6,-18),(-3,9),(1,-3)\}$

$$\begin{vmatrix} 0 & 1 & 2x & 3x^2 \\ 0 & 0 & 2 & 6x \\ 0 & 0 & 0 & 6 \end{vmatrix} \Rightarrow \begin{vmatrix} 1 & 2x & 3x^2 \\ 0 & 2 & 6x \\ 0 & 0 & 6 \end{vmatrix}$$

5) The Wronskian of $f_1 = 1$, $f_2 = x$, $f_3 = x^2$, $f_4 = x^3$ equals

$$\begin{vmatrix} 2 & 6x \\ 0 & 6 \end{vmatrix} = 12$$

(a) 0	$\boxed{\text{(b)}}$ 12	(c) x^6	(d) $3x^2$

6) Let $S = \{(2,0,-1),(4,0,7),(-1,1,4)\} \subset \mathbb{R}^3$. Then

$$\begin{bmatrix} 2 & 4 & -1 \\ 0 & 0 & 1 \\ -1 & 7 & 4 \end{bmatrix}$$

$$-\begin{vmatrix} 2 & 4 \\ -1 & 7 \end{vmatrix} - (14-(-4)) \quad -(18)$$

(a) S is linearly dependent	(b) S is linearly independent, but not a basis of $\mathbb{R}^3$	(c) S is linearly dependent, but S spans $\mathbb{R}^3$	$\boxed{\text{(d)}}$ S is a basis of $\mathbb{R}^3$

7) If the vectors $(5, \frac{2}{3})$ and $(7, x)$ are linearly dependent, then x equals

$\frac{7}{5} \quad \frac{2}{3} \cdot \frac{7}{5} = \frac{14}{15}$

(a) $\frac{7}{5}$	(b) $\frac{5}{7}$	$\boxed{\text{(c)}}$ $\frac{14}{15}$	(d) $\frac{15}{14}$

8) Let $V = \mathbb{R}^3$. Which of the following subsets of V is subspace of V?

(a) $\{(a,1,1), a \in \mathbb{R}\}$	(b) $\{(x,y,z) : 3x - 4y + 5z - 8 = 0\}$	$\boxed{\text{(c)}}$ $\{(x,y,z) : x = 3t, y = 4t, z = -t, t \in \mathbb{R}\}$	(d) $\{(x,y,z) : x^2 = y^2\}$

9) Which of the following vectors span $\mathbb{R}^3$?

$$\begin{bmatrix} 2 & 4 & 8 \\ -1 & 1 & -1 \\ 3 & 2 & 8 \end{bmatrix}$$

$$\begin{vmatrix} 4 & 8 \\ 2 & 8 \end{vmatrix} + \begin{vmatrix} 2 & 8 \\ 3 & 8 \end{vmatrix} + \begin{vmatrix} 2 & 4 \\ 3 & 2 \end{vmatrix} = (32-16)+(16-24)+(4-12)$$

$$\cancel{= 16 + (-8) - 8 = 0}$$

$$\begin{bmatrix} 2 & 0 & 0 \\ 2 & 0 & 1 \\ 2 & 3 & 1 \end{bmatrix} = \begin{bmatrix} 2 & 0 & 0 \\ 2 & 1 & 0 \\ 2 & 1 & 3 \end{bmatrix}$$

$\det(A) = 6$

$\boxed{\text{(a)}}$ $(2,2,2),(0,0,3),(0,1,1)$	× (b) $(2,-1,3),(4,1,2),(8,-1,8)$	(c) $(1,1,2),(1,0,1),(2,1,3)$	(d) $(1,2,4),(2,4,8),(-1,0,0)$

10) A linear combination of the vectors $v_1 = (1,1,0)$, $v_2 = (0,-1,1)$, $v_3 = (1,0,1)$ is

(a) $(1,1,1)$	(b) $(3,2,1)$	(c) $(2,2,1)$	(d) $(2,1,3)$

$$\begin{bmatrix} 1 & 0 & 1 \\ 1 & -1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$$

$-R_1 + R_2$

$$\begin{bmatrix} 1 & 1 & 2 \\ 1 & 0 & 1 \\ 2 & 1 & 3 \end{bmatrix}$$

$\det(A) = 0$

$k_1 v_1 + k_2 v_2 + k_3 v_3$

$k_1(1,1,0) + k_2(0,-1,1) + k_3(1,0,1)$

$(k_1, k_1, 0) + (0, -k_2, k_2) + (k_3, 0, k_3)$

$k_1 + k_3 =$

$k_1 - k_2$

$$\left[\begin{array}{ccc|c|c|c|c} 1 & 0 & 1 & 1 & 3 & 2 & 2 \\ 1 & -1 & 0 & 1 & 2 & 2 & 1 \end{array}\right]$$