A. 1) $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$ or any multiple $\to 7/2$

$\begin{bmatrix} 0 \\ 1 \end{bmatrix}$ or any multiple $\to 1$

2) $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ —— " —— $\to -1$

$\begin{bmatrix} -1 \\ 1 \end{bmatrix}$ —— " —— $\to 1$

3) none

4) $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$ —— " —— $\to 1$

B. $\begin{bmatrix} 1 \\ 1 \end{bmatrix} \to 2$

$\begin{bmatrix} -1 \\ 1 \end{bmatrix} \to 7/2$

C. 1) $(3-\lambda)(2-\lambda)-20 = \lambda^2 - 5\lambda - 14$

2) $\lambda = 7,\ \lambda = -2$

3) $\lambda = 7$ Span $\left\{ \begin{bmatrix} -1 \\ 1 \end{bmatrix} \right\}$.

$\lambda = -2$ Span $\left\{ \begin{bmatrix} 4/5 \\ 1 \end{bmatrix} \right\}$.

D. 1)

eigvals	$\lambda=a$	$\lambda=b$	$\lambda=c$
mult	1	1	1
espc.	$\text{span}\left\{\begin{bmatrix}1\\0\\0\end{bmatrix}\right\}$	$\text{span}\left\{\begin{bmatrix}0\\1\\0\end{bmatrix}\right\}$	$\text{span}\left\{\begin{bmatrix}0\\0\\1\end{bmatrix}\right\}$.
dims	1	1	1

2)

eigvals	$\lambda=a$	$\lambda=b$
mult	2	1
espc.	$\text{span}\left\{\begin{bmatrix}1\\0\\0\end{bmatrix},\begin{bmatrix}0\\1\\0\end{bmatrix}\right\}$	$\text{span}\left\{\begin{bmatrix}0\\0\\1\end{bmatrix}\right\}$
dims	2	1

3)

eigvals	$\lambda=a$	$\lambda=b$
mult	2	1
espc	$\text{span}\left\{\begin{bmatrix}1\\0\\0\end{bmatrix}\right\}$	$\text{span}\left\{\begin{bmatrix}0\\0\\1\end{bmatrix}\right\}$
dims	1	1

E. 1) $\dfrac{d(f(t)+g(t))}{dt} = \dfrac{df(t)}{dt} + \dfrac{dg(t)}{dt}$

$\dfrac{d\,cf(t)}{dt} = c\,\dfrac{df(t)}{dt}.$

2) all ~~constant~~ polynomials

3) all of P

4) ~~N~~No: $S(2t) = 4t^2$

$\neq$

$2S(t) = 2t^2.$

F. 1) $A(X+Y) = AX + AY$

$A(cX) = cAX.$

2) $\underbrace{\text{Span}\left\{\begin{bmatrix} -1/2 & 0 \\ 1 & 0 \end{bmatrix}, \begin{bmatrix} 0 & -1/2 \\ 0 & 1 \end{bmatrix}\right\}}_{\text{basis}}$

3) $\underbrace{\text{Span}\left\{ \begin{bmatrix} 2 & 0 \\ -4 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 2 \\ 0 & -4 \end{bmatrix} \right\}}_{\text{basis}}$

6. $$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 1 & 1 & 1 \end{bmatrix} = \underset{\mathcal{C} \leftarrow \mathcal{B}}{P}$$

$$\underset{\mathcal{C} \leftarrow \mathcal{B}}{P} \cdot \begin{bmatrix} 3 \\ -4 \\ 1 \\ -5 \end{bmatrix} = \begin{bmatrix} 3 \\ -4 \\ 1 \\ -5 \end{bmatrix}.$$

4, 2) If $\underline{x} = \begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix}$, then

$\underline{x} = x_1 \underline{e_1} + \cdots + x_n \underline{e_n}$, so

$$[\underline{x}]_{\mathcal{E}} = \begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix}.$$

2) P_β

3). Inverses to each other.

4) $P_{\mathcal{E} \leftarrow \beta} = P_{\mathcal{E}}^{-1} P_\beta$.

I, J: see last week