

1. What is the dimension of the vector subspace of P_2 spanned by (consists of all linear combinations of) the polynomials t , $1 - t$, and $t(1 - t)$?

- a) 5 b) 1 c) 4 d) 2 e) 3

Correct Answer: 3

2. What is the dimension of the vector subspace of P_3 which is spanned by the polynomials t^2 , and $(1 - t)^2$?

- a) 5 b) 2 c) 4 d) 2 e) 1

Correct Answer: 2

3. Which polynomial has coordinate vector with respect to the standard basis $\{1, t, t^2\}$ equal to: $\begin{pmatrix} 1 \\ -2 \\ 0 \end{pmatrix}$.

- a) $(t + 1)^2$ b) $(t - 1)^2 - t^2$ c) $(t - 2)^2 + (t - 1)^2$ d) $t^2 - (t - 1)^2$ e) $(t + 2)^2$

Correct Answer: $(t - 1)^2 - t^2$

4. Let S be the set $\{(t - 4)^2, (t - 3)^2, t - 3\}$ of polynomials in P_2 . Determine whether the following statements are True or False. The answers are in order i), ii), iii).

- i) S is a top-down basis of P_2 ii) S spans P_2 iii) S is linearly independent

- a) FFT b) TTT c) FFF d) TTT e) TTF

Correct Answer: TTT

5. Let S be the set $\{(t - 1)^2, t - 1, t^2 - 1\}$ of polynomials in P_2 . Determine whether the following statements are True or False. The answers are in order i), ii), iii).

- i) S is a basis of P_2 ii) S spans P_2 iii) S is linearly independent

- a) FFT b) TTT c) FFF d) TFT e) TFF

Correct Answer: FFF

6. Which of the following are True statements about binomial coefficients, if $0 \leq k \leq d$?

- i) $\binom{d}{k} = \binom{d-1}{k} + \binom{d-1}{k-1}$ ii) $\binom{d}{k} = \binom{d}{d-k}$ iii) $\binom{d}{1} = d \binom{d}{0}$

- a) FTT b) TTT c) TTF d) FTT e) TFT

Correct Answer: TTT

7. Compute $\binom{4}{2} + \binom{4}{3}$:

- a) 8 b) 9 c) 10 d) 6 e) 7

Correct Answer: 10

8. If V is a vector space with dimension $n - 1$, and $S = \{\mathbf{v}_1, \dots, \mathbf{v}_n\}$ is a set of n vectors in V then which of the following must be true:

- i) S cannot span V ii) S is a basis of V iii) S is linearly independent

- a) i) and ii) only b) i) only c) ii) only d) ii) and iii) only e) iii) only

Correct Answer: none of the above (all answers marked correct)

9. Find the coefficient of $t - 1$ in the polynomial $1 - (t - 2) + (t - 2)^2$ when converted to the shifted basis $\{1, t - 1, (t - 1)^2\}$.

- a) -2 b) -4 c) -3 d) -5 e) -6

Correct Answer: -3

10. If A is the change of basis matrix from B_1 to B_2 and C is the change of basis matrix from B_1 to B_3 , then the change of basis matrix from B_3 to B_2 is:

- a) AC^{-1} b) $C^{-1}A^{-1}$ c) AC d) CA^{-1} e) $(AC)^{-1}$

Correct Answer: AC^{-1}