

TEST 2

Solve the following problems (3 course points each). Present a brief motivation of your method of solution. Explicitly state any conditions that must be met for solution procedure to be valid. Sketch out a solution for yourself on scratch paper, and then neatly transcribe so the solution you present is readily legible.

No credit is awarded for statement of the final answer to a problem without presentation of the solution procedure.

1. At $t=0$ an object is placed in a room with temperature of 20° C. The temperature of the object drops by 5° C in 4 minutes and by 7° C in 8 minutes . What was the temperature of the object at $t=0$?

2. Determine whether $\mathbf{B}$ is a basis set for real-valued 2 by 2 matrices

$$\mathbf{B} = \{ \mathbf{B}_1, \mathbf{B}_2, \mathbf{B}_3 \} = \left\{ \begin{pmatrix} 1 & 3 \\ 2 & 1 \end{pmatrix}, \begin{pmatrix} -1 & 2 \\ 1 & 0 \end{pmatrix}, \begin{pmatrix} 0 & 1 \\ 0 & -4 \end{pmatrix} \right\}.$$

3. Let

$$\mathcal{S} = \left\{ \begin{pmatrix} 2s - t \\ s \\ t \\ -s \end{pmatrix}, s, t \in \mathbb{R} \right\}.$$

- a) Prove that $(\mathcal{S}, +, \mathbb{R}, \cdot)$ a subspace of $(\mathbb{R}^4, +, \mathbb{R}, \cdot)$.
- b) Find two vectors that span $\mathcal{S}$.

4. Find and subsequently sketch the solution to the initial value problem

$$y'' - 14y' + 49y = 0, y(1) = 2, y'(1) = 11.$$