

Name (Last, First Middle): _____

Use of books, notes or calculators is **NOT** permitted. Show all your work! Answers without appropriate supporting work may not receive full credit. Clearly indicate your answers to each problem by underlining them or placing a box around your answers!

1. [50] Find the antiderivative F of $f(x) = 5x^4 - 2x^5$ that satisfies $F(0) = 4$

$$F(x) = \int (5x^4 - 2x^5) dx = x^5 - \frac{x^6}{3} + C$$

$$F(0) = 4 \Rightarrow \boxed{C = 4}$$

$$\Rightarrow \boxed{F(x) = x^5 - \frac{x^6}{3} + 4}$$

2. [50] Find the function $f(\theta)$, if $f''(\theta) = \sin \theta + \cos \theta$, $f(0) = 3$ and $f'(0) = 4$.

$$f'(\theta) = -\cos \theta + \sin \theta + C$$

$$f'(0) = 4$$

$$\left\{ \begin{array}{l} \Rightarrow -\cos 0 + \sin 0 + C = 4 \\ \Rightarrow -1 + 0 + C = 4 \end{array} \right. \Rightarrow \boxed{C = 5}$$

$$\Rightarrow f'(\theta) = -\cos \theta + \sin \theta + 5$$

$$f(\theta) = -\sin \theta - \cos \theta + 5\theta + D$$

$$f(0) = 3$$

$$\left\{ \begin{array}{l} \Rightarrow -\sin 0 - \cos 0 + 5 \cdot 0 + D = 3 \\ \Rightarrow 0 - 1 + 0 + D = 3 \end{array} \right. \Rightarrow \boxed{D = 4}$$

$$\Rightarrow \boxed{f(\theta) = -\sin \theta - \cos \theta + 5\theta + 4}$$