****

**كلية العلوم**

**قسم الفيزياء والفلك**

**College of Sciences**

**Department of**

**Physics and Astronomy**

**Tutorial 5**

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|  | **PHYS 400**  | **Academic year 1444 H**  |
| **Computational Physics** |  **Semester 442** |

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| **ID number** |  | **الرقم الجامعي** |

Consider the function

$$f\left(x\right)=3 cos^{2}⁡(x)$$

1. find the exact analytical form of

 $\frac{d^{2}f}{dx^{2}}=f^{''}\left(x\right)=\cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots $

 $\cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots $

$$\cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots \cdots $$

1. Fill the table below for $x=π$ using the 3‐points formula

|  |  |
| --- | --- |
| *h* | $$f^{''}\left(π\right)$$ |
| 1 |  |
| 0.001 |  |
| $$10^{-6}$$ |  |

 Compare the values to the exact $f'^{'}\left(π\right)$ and conclude

*……………………………………………………………………………………………………………………………………………………………………………………………..*

1. Write a Python programallowing to evaluate and plot both the exact analytical form and the numerical 3 points method of the second derivative of $f\left(x\right)$ in the interval [0, 2π] using 1000 slices.

*Save the final program and name it: T5*

