Module 3 Mastery Assignment

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Content

We want to approximate the function $f(x)$ that satisfies the following conditions:

- Is a real or a complex-value function.
- It is infinitely differentiable at c

$$P(0) = f(0)$$
$$P(x) = f(0)$$

$$
\begin{aligned}
P'(0) &= f'(0) \\
P(x) &= f(0) + f'(0)\,x
\end{aligned}
$$

$$P''(0) = f''(0)$$

$$P(x) = f(0) + f'(0)\,x + \frac{1}{2} f''(0)\,x^2$$

$$P'''(0) = f'''(0)$$

$$P(x) = f(0) + f'(0)\,x + \frac{1}{2} f''(0)\,x^2 + \frac{1}{2 \cdot 3} f'''(c)\,x^3$$

$$P^{(4)}(0) = f^{(4)}(0)$$

$$P(x) = f(0) + f'(0)\,x + \frac{1}{2}f''(0)\,x^2 + \frac{1}{2\cdot 3}f'''(c)\,x^3 + \frac{1}{2\cdot 3\cdot 4}f^{(4)}(0)\,x^4$$

$$
\begin{aligned}
P^{(4)}(0) =& f^{(4)}(0) \\
P(x) =& f(0) + f'(0)\,x + \frac{1}{2} f''(0)\,x^2 + \frac{1}{2 \cdot 3} f'''(c)\,x^3 + \frac{1}{2 \cdot 3 \cdot 4} f^{(4)}(0)\,x^4 \\
& + \cdots + \frac{1}{n!} f^{(n)}(0)\,x^n
\end{aligned}
$$

$$\sum_{n=0}^{\infty} \frac{1}{n!} f^{(n)}(0)\, x^n$$

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