

An abstract graphic consisting of multiple overlapping, flowing lines in shades of blue and white. The lines originate from the left side and curve towards the right, creating a sense of motion and depth. Some lines are thicker and more prominent, while others are thinner and more delicate. The overall effect is a dynamic, organic shape that resembles a stylized wave or a plume of smoke.

# Module 3 Mastery Assignment

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## Taylor Polynomials

Intro

Intuitive Derivation

License



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  $c$



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

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



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

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



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

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



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

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



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

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



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Intuitive Derivation



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

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

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Intuitive Derivation



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



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