

ezLecture: Introduction to Drag NOTES

Learning Goals:

1. Be able to approximate the drag force using a series.

1. Use a series to approximate the drag force.

A) Taylor Series – a series of polynomials that is used to approximate a function. There are two ways to write a Taylor series. If you would like to approximate experimental data, the Taylor series is generally written as:

$$f(x) = a_0 + a_1(x - a)^1 + a_2(x - a)^2 + a_3(x - a)^3 + \dots + a_n(x - a)^n$$

If you would like to approximate a known mathematical function, then the Taylor series is generally written as:

$$f(x) = f(a) + f'(a)(x - a)^1 + \frac{f''(a)}{2!}(x - a)^2 + \frac{f'''(a)}{3!}(x - a)^3 + \dots + \frac{f^{(n)}(a)}{n!}(x - a)^n$$

B) Drag Force approximation – the drag force is a force that resists an object's motion. Therefore, it has a direction with opposes the object's motion and a magnitude that is dependent on the speed of the object.

$$\vec{f} = -f(v)\hat{v} = -bv\hat{v} - cv^2\hat{v}$$