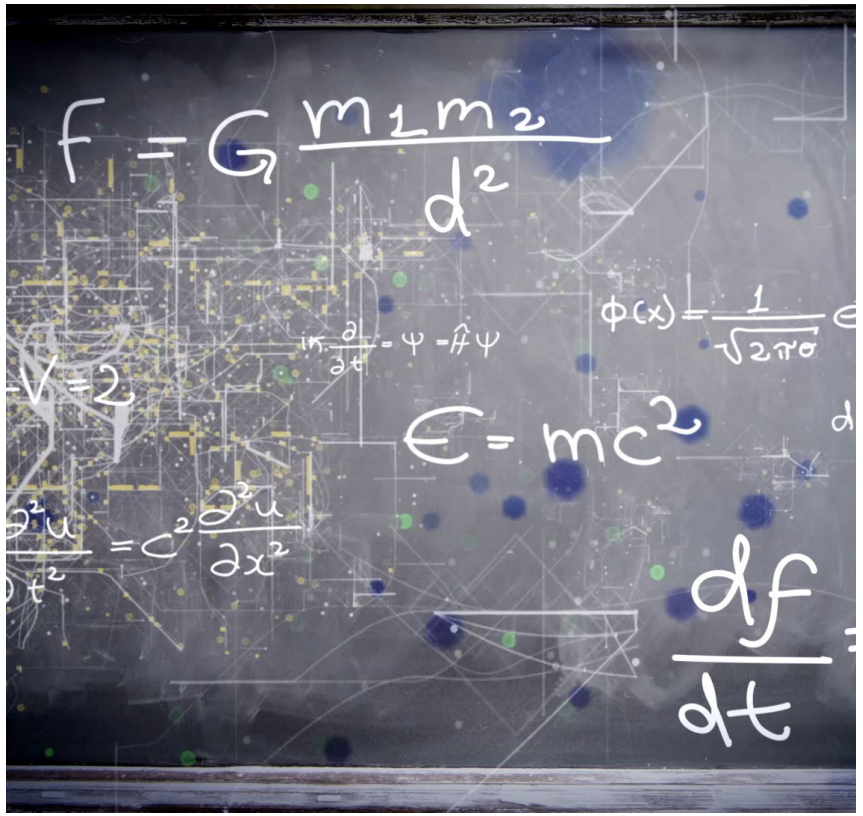
BASIC DERIVATIVE & INTEGRAL RELATIONS

Math is the language of engineers and scientist

ENGINEERING PRODUCT DEVELOPMENT

- Developing engineering solutions to improve mankind using applied math for idea creation, idea analysis, product development and testing, and product realization.



Basic Derivatives/Integrals

$$\frac{d}{dx}(\sin ax) = \cos(ax)\frac{d}{dx}(ax), \quad \frac{d}{dx}(\cos ax) = -\sin(ax)\frac{d}{dx}(ax)$$

$$\int \sin(ax)dx = \frac{-\cos(ax)}{\frac{d}{dx}(ax)} + C, \quad \int \cos(ax)dx = \frac{\sin(ax)}{\frac{d}{dx}(ax)} + C$$

$$\frac{d}{dx}(e^{ax}) = e^{ax}\frac{d}{dx}(ax), \qquad \int e^{ax}dx = \frac{e^{ax}}{\frac{d}{dx}(ax)} + C$$

$$\int e^{ax} \sin bx \, dx = \frac{e^{ax}}{a^2 + b^2} [a \sin bx - b \cos bx] + c$$

$$\int e^{ax} \cos bx \, dx = \frac{e^{ax}}{a^2 + b^2} [a \cos bx + b \sin bx] + c$$

"a" and "b" are the ODE equation constants

"c" is the arbitrary constant of integration

GENERAL SOLUTION 1ST ORDER PDE

$$\frac{dy}{dx} + p(x)y = f(x)$$

HAS GENRAL SOLUTION OF:

$$y(x) = Ce^{-\int p(x)dx} + e^{-\int p(x)dx} \int e^{\int +p(x)dx} f(x)dx$$

$C \equiv$ Arbitrary Constant of Integration Obtained

From Initial Condition $y(x=0)=Y_0 \rightarrow C$

SPECIAL CASE: p(x) = 0

$$y(x)=C+\int f(x)dx$$

SPECIAL CASE: f(x) = 0

$$y(x)=Ce^{-\int p(x)dx}$$