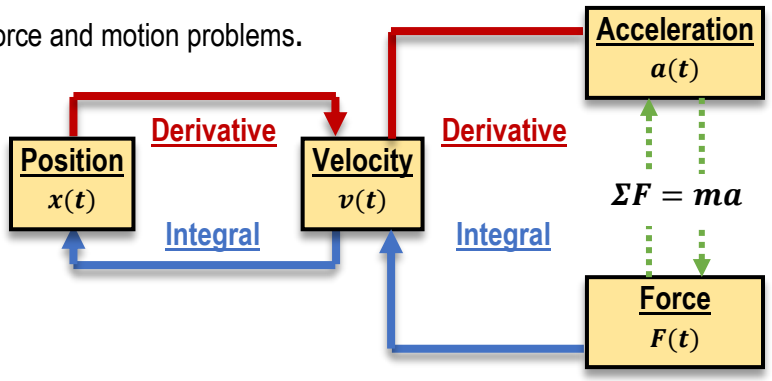
CONCEPT: SOLVING FORCE PROBLEMS USING CALCULUS

- You'll need to solve problems combining forces and motion functions [x(t), v(t), a(t)].
  - Remember! Acceleration **a(t)** is the **LINK** between force and motion problems.

EXAMPLE: A 30 kg block starts from rest and travels with a speed according to the function $\boldsymbol{v(t)} = 3t + 0.2t^2$. What is the force acting on the block at t = 4s?

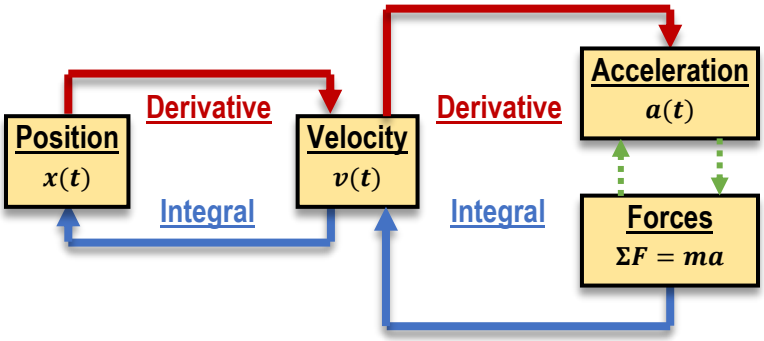


FORCES

1) Draw FBD: **W,F_A,T,N,f**
2) Write $\boldsymbol{\Sigma F = ma}$
3) Solve

PROBLEM: A 2-kg mass has the position function $\boldsymbol{x(t)} = (2t^3 - 4t^2 + 3)$, where $\boldsymbol{x}$ is in meters and $\boldsymbol{t}$ is in seconds. What is the net force on the mass at t = 4 s?

A) 80N
B) 0.67N
C) 2N
D) 10N



PROBLEM: A rocket-propelled toy car of mass 45 kg is initially at rest on a frictionless, ice-covered lake. A time-varying force $\boldsymbol{F(t)= 9t}$ acts to the east. How far does the object travel in the first 5s after the force is applied?

A) 0.83 m
B) 12.5 m
C) 4.17m
D) 5 m