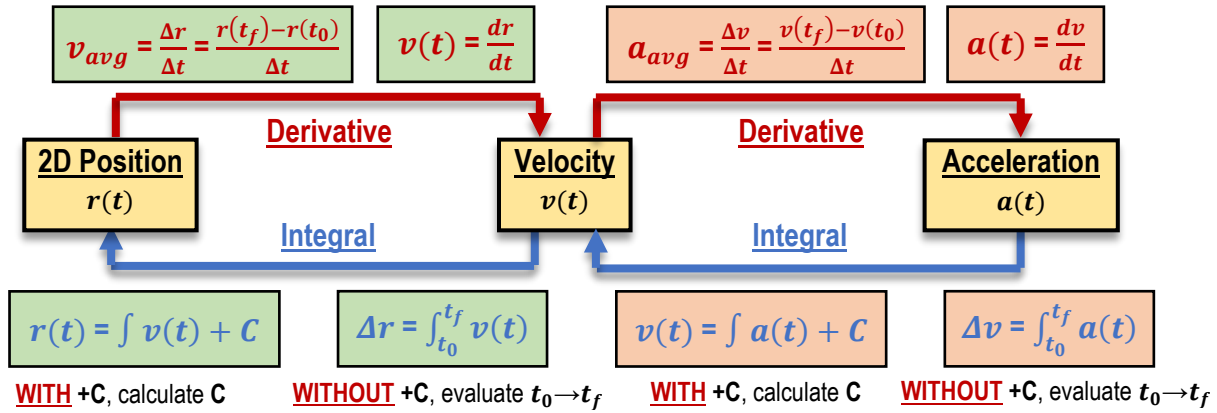


CONCEPT: SOLVING PROBLEMS WITH VELOCITY AND ACCELERATION FUNCTIONS IN 2D

- Some problems will GIVE a function for one motion variable [$\mathbf{r}(t)$, $\mathbf{v}(t)$, or $\mathbf{a}(t)$] and ASK for a different variable.
 - Solve $\mathbf{v}(t) \Leftrightarrow \mathbf{a}(t)$ problems using the SAME operations as $\mathbf{r}(t) \Leftrightarrow \mathbf{v}(t)$.

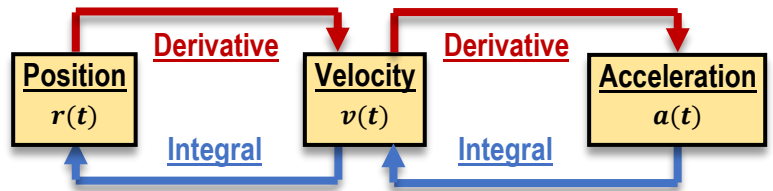


EXAMPLE: A car has a velocity $\mathbf{r}(t) = (t^2 - 3t + 4) \hat{i} + (6t - 7) \hat{j}$. Determine the car's acceleration function $\mathbf{a}(t)$.

EXAMPLE: A car has an acceleration $\mathbf{a}(t) = (t - 3) \hat{i} + 7 \hat{j}$. Calculate the change in velocity from $t = 6\text{s}$ to $t = 8\text{s}$.

PROBLEM: A toy airplane is flying in an x/y plane parallel to the ground with a velocity $v(t) = (4t - 0.015t^3)\hat{i} + (1.8 + 0.5t)\hat{j}$. What is the magnitude of the airplane's acceleration at $t=30$ s?

- A) 36.5 m/s^2
- B) 285 m/s^2
- C) -36.0 m/s^2
- D) -268.2 m/s^2



PROBLEM: An iceboat on a frozen lake has acceleration $a(t) = 2t\hat{i} + \left(1 - \frac{4}{t^3}\right)\hat{j}$. At $t = 4$ s, the iceboat's velocity is $v = 8\hat{i} + 4.125\hat{j}$. What is the particle's displacement between $t = 2$ s and $t = 10$ s?

- A) $330\hat{i} + 46\hat{j}$
- B) $253\hat{i} + 49.8\hat{j}$
- C) $267\hat{i} + 48.8\hat{j}$

