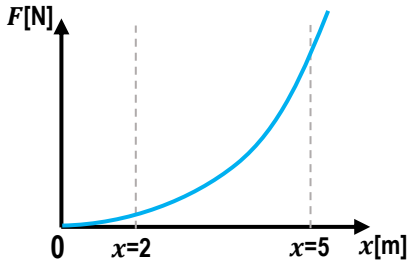
CONCEPT: CALCULATING WORK BY INTEGRATING VARIABLE FORCES

● You'll need to calculate the Work done between 2 points when given Forces that are FUNCTIONS of position _____.

- **Remember:** Graphically, Work = **AREA** under F-x graph.

- Because **F** is *variable* and the graph is *CURVY*, we take the _____.

$W_{a\to b}$ = _____



EXAMPLE: You push a box along a flat, smooth surface with a variable Force. The force can be modeled as $F(x) = 3x^2$. Calculate the work done as the box travels from x = 2m to x = 5m.

Integrals:

$$\int x^N dt = \frac{x^{N+1}}{N+1}$$

PROBLEM: A metal can is pushed from $x = 0.5$m to $x = 1.5$m with a force given by the function $F(x) = 2e^{-2x}$. How much work is done by the force on the metal can?

$$W_{a\to b} = \int_a^b F(x)dx$$

PROBLEM: You push a 5kg box with a force given by the function $F(x) = 13 - 0.6x$. Assuming there's no friction forces, and the box is initially at rest at $x = 0$, how fast is the box moving after it has traveled a distance of 20m?

A) 5.37 m/s
B) 2.83 m/s
C) 7.48 m/s
D) 24.95 m/s

$$W_{a\to b} = \int_a^b F(x)dx$$

Integrals:

$$\int x^N dt = \frac{x^{N+1}}{N+1}$$