Integration by Substitution Writing Frame
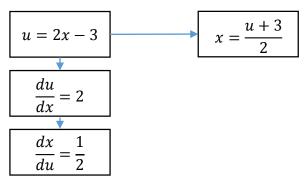
What I'm asked to integrate…

$$\boxed{}$$

1) The substitution

$$\boxed{u = \quad} \longrightarrow \boxed{x = \quad}$$

$$\boxed{\dfrac{du}{dx} =}$$

$$\boxed{\dfrac{dx}{du} =}$$

2) Rewrite the question. If any x terms cancel then do so, otherwise include substitutions for all x variables. Decide if you will convert the x limits into u limits or integrate without limits and re-substitute for x.

3) Do the integration

4) Evaluate the integral between the limits

Integration by Substitution Writing Frame

What I'm asked to integrate…

$$\int_1^4 (2x-3)^2 \, dx$$

1) The substitution

$u = 2x - 3$ → $x = \dfrac{u+3}{2}$

$\dfrac{du}{dx} = 2$

$\dfrac{dx}{du} = \dfrac{1}{2}$

2) Rewrite the question. If any x terms cancel then do so, otherwise include substitutions for all x variables. Decide if you will convert the x limits into u limits or integrate without limits and re-substitute for x.

$$\int_{2\times1-3}^{2\times4-3} u^2 \frac{dx}{du} \, du$$

$$\int_{-1}^{5} u^2 \times \frac{1}{2} \, du$$

$$\int_{-1}^{5} \frac{u^2}{2} \, du$$

or

$$\int u^2 \frac{dx}{du} \, du$$

$$\int u^2 \times \frac{1}{2} \, du$$

$$\int \frac{u^2}{2} \, du$$

3) Do the integration

$$\int_{-1}^{5} \frac{u^2}{2} \, du$$

$$\left[\frac{u^3}{6} \right]_{-1}^{5}$$

or

$$\int \frac{u^2}{2} \, du$$

$$\left[\frac{u^3}{6} \right]$$

4) Evaluate the integral between the limits

$$\frac{5^3}{6} - \frac{(-1)^3}{6}$$

$$\frac{125}{6} + \frac{1}{6} = \frac{126}{6} = \frac{63}{3} = 21$$

or

$$\left[\frac{(2x-3)^3}{6} \right]_1^4$$

$$\left(\frac{(2\times4-3)^3}{6} \right) - \left(\frac{(2\times1-3)^3}{6} \right)$$

$$\left(\frac{5^3}{6} \right) - \left(\frac{(-1)^3}{6} \right)$$

$$\frac{125}{6} + \frac{1}{6} = \frac{126}{6} = \frac{63}{3} = 21$$