

$$\int_2^5 (x+1)^2 dx, \quad \text{let } u=x+1, \quad \therefore dx=du$$

Method 1 - Transform Limits

*Substitute  $x=2$  and  $x=5$  into  $u$  equation*

$$u=2+1=3 \quad u=5+1=6$$

$$\therefore \int_2^5 (x+1)^2 dx = \int_3^6 u^2 du$$

$$= \left[ \frac{1}{3} u^3 \right]_3^6$$

$$= \left[ \frac{1}{3} 6^3 - \frac{1}{3} 3^3 \right]$$

$$= 72 - 9$$

$$= 63$$

Method 2 - Re-substitute

*Drop the limits of integration*

$$\therefore \int (x+1)^2 dx = \int u^2 du$$

$$= \left[ \frac{1}{3} u^3 \right]$$

*Resubstitute the  $u$ -equation and evaluate with original  $x$  limits*

$$= \left[ \frac{1}{3} (x+1)^2 \right]_2^5$$

$$= \left[ \frac{1}{3} 6^3 - \frac{1}{3} 3^3 \right]$$

$$= 72 - 9$$

$$= 63$$