5.5   1) $1 \cdot 2 + 2 \cdot 3 + 3 \cdot 4 + 4 \cdot 5 + \ldots + n\,(n+1) = \sum_{k=1}^{n} k\,(k+1)$

2) $\displaystyle \sum_{k=1}^{n} k\,(k+1) = \sum_{k=1}^{n} k^2 + k = \sum_{k=1}^{n} k^2 + \sum_{k=1}^{n} k = \frac{n\,(n+1)\,(2\,n+1)}{6} + \frac{n\,(n+1)}{2}$

$\displaystyle = \frac{n\,(n+1)\,(2\,n+1) + 3\,n\,(n+1)}{6} = \frac{n\,(n+1)\,\big((2\,n+1)+3\big)}{6}$

$\displaystyle = \frac{n\,(n+1)\,\overbrace{(2\,n+4)}^{2\,(n+2)}}{6} = \frac{2\,n\,(n+1)\,(n+2)}{6} = \frac{n\,(n+1)\,(n+2)}{3}$