- ***Problem 9.2(g-h).** Tinker and then compute formulas that do not contain a sum for the following:

(g) $\sum_{i=1}^{n} ij$

$= j \sum_{i=1}^{n} i$ Constant Rule

$= j \frac{n(n+1)}{2}$ Common Sums

(h) $\sum_{i=0}^{n} (i+j)^2$

$= \sum_{i=0}^{n} (i^2 + 2ij + j^2)$ Distribute

$= \sum_{i=0}^{n} (i^2) + \sum_{i=0}^{n} (2ij) + \sum_{i=0}^{n} (j^2)$ Addition Rule

$= \frac{n(n+1)(2n+1)}{6} + \sum_{i=0}^{n} (2ij) + \sum_{i=0}^{n} (j^2)$ Common Sums

$= \frac{n(n+1)(2n+1)}{6} + 2j \sum_{i=0}^{n} i + j^2 \sum_{i=0}^{n} 1$ Constant Rule

$= \frac{n(n+1)(2n+1)}{6} + 2j \frac{n(n+1)}{2} + j^2(n+1)$ Common Sums

$= \frac{n(n+1)(2n+1)}{6} + jn(n+1) + j^2 n + j^2$ Simplify and Distribute

- ***Problem 9.3(j-k).** Compute formulas that do not contain a sum for the following:

(j) $\sum_{i=0}^{n} \sum_{j=0}^{i} 2^i$

$$= \sum_{i=0}^{n} i \sum_{j=0}^{i} 2^i \qquad \text{Innermost Sum}$$

$$= \sum_{i=0}^{n} i(2^{i+1} - 1) \qquad \text{Common Sums}$$

$$= \sum_{i=0}^{n} (i2^{i+1} - i) \qquad \text{Distribute}$$

$$= \sum_{i=0}^{n} i2^{i+1} - \sum_{i=0}^{n} i \qquad \text{Addition Rule}$$

$$= \sum_{i=0}^{n} i2^{i} \cdot 2^1 - \sum_{i=0}^{n} i \qquad \text{Simplify}$$

$$= 2\sum_{i=0}^{n} i2^{i} - \sum_{i=0}^{n} i \qquad \text{Constant Rule}$$

$$= 2(\tfrac{n(n+1)}{2})(2^{n+1} - 1) - \tfrac{n(n+1)}{2} \qquad \text{Common Sums}$$

$$= n(n+1)(2^{n+1} - 1) - \tfrac{n(n+1)}{2} \qquad \text{Simplify}$$

- ***Problem 9.14.** Determine which of these functions is in $\Theta(n)$, in $\Theta(n^2)$, or neither.

$\Theta(n)$	$\Theta(n^2)$	neither
b	e	a
c	i	g
d		h
f		j

- ***Problem 9.31(a-b).** Give the asymptotic big-Theta behavior of the runtime T_n, where,

  (a) $T_0 = 1$; $T_n = T_{n-1} + n^2$; for $n \geq 2$

  $\Theta(n)$

  (b) $T_0 = 1$; $T_1 = 2$; $T_n = 2T_{n-1} - T_{n-2} + 2$ for $n \geq 2$

  $\Theta(2^n)$