Solution

1. (a) $\sum_{k=1}^{3}(k+1) = (1+1)+(2+1)+(3+1)$

   (b) $\sum_{m=0}^{1}\frac{1}{2^m} = \frac{1}{2^0}+\frac{1}{2^1}$

   (c) $\sum_{k=-1}^{2}(k^2+3) = (1+3)+(0+3)+(1+3)+(4+3)$

   (d) $\sum_{j=0}^{4}(-1)^j\frac{j}{j+1} = 0-\frac{1}{2}+\frac{2}{3}-\frac{3}{4}+\frac{4}{5}$

   (e) $\sum_{k=1}^{5}(2k) = 2+4+6+8+10$

   (f) $\prod_{i=2}^{4}\frac{i(i+2)}{(i-1)(i+1)} = \frac{2\cdot 4}{1\cdot 3}\cdot\frac{3\cdot 5}{2\cdot 4}\cdot\frac{4\cdot 6}{3\cdot 5}$

2. (a) $3+6+12+24+48+96 = \sum_{i=0}^{5}3\cdot 2^i$

   (b) $\frac{1}{3}+\frac{4}{9}+\frac{9}{27}+\frac{16}{81}+\frac{25}{243}+\frac{36}{729} = \sum_{j=1}^{6}\frac{j^2}{3^j}$

   (c) $0+1-2+3-4+5 = \sum_{j=0}^{5}(-1)^{j+1}\cdot j$

   (d) $\left(\frac{1}{1+1}\right)\times\left(\frac{2}{2+1}\right)\times\left(\frac{3}{3+1}\right)\times\cdots\times\left(\frac{k}{k+1}\right) = \prod_{j=1}^{k}\left(\frac{j}{j+1}\right)$

   (e) $\left(\frac{1\cdot 2}{3\cdot 4}\right)\times\left(\frac{2\cdot 3}{4\cdot 5}\right)\times\left(\frac{3\cdot 4}{5\cdot 6}\right) = \prod_{j=1}^{3}\frac{j\cdot(j+1)}{(j+2)\cdot(j+3)}$

3. (a) $$\begin{aligned} 3\cdot\sum_{k=1}^{n}(2k-3)+\sum_{k=1}^{n}(4-5k) &= 6\cdot\left(\sum_{k=1}^{n}k\right)-9\cdot\left(\sum_{k=1}^{n}1\right)+4\cdot\left(\sum_{k=1}^{n}1\right)-5\cdot\left(\sum_{k=1}^{n}k\right) \\ &= \sum_{k=1}^{n}(k-5) \end{aligned}$$

   (b) $$\begin{aligned} \left(\prod_{k=1}^{n}\frac{k}{k+1}\right)\left(\prod_{k=1}^{n}\frac{k+1}{k+2}\right) &= \left(\prod_{k=1}^{n}\frac{k}{k+1}\cdot\frac{k+1}{k+2}\right) \\ &= \left(\prod_{k=1}^{n}\frac{k}{k+2}\right) \end{aligned}$$

4. (a) False. Test program G (or K) to verify.

   (b) True. Test programs A, E, L to verify.