Problem 1. Write each expression in sigma notation but do not evaluate

(a) $1 + 2 + 3 + \cdots + 10$
(b) $3 \cdot 1 + 3 \cdot 2 + 3 \cdot 3 + \cdots + 3 \cdot 20$
(c) $2 + 4 + 6 + 8 + \cdots + 20$
(d) $1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5}$

Problem 2. Express the sum of the even integers from 2 to 100 in sigma notation

Problem 3. Evaluate the following sums

(a) $\displaystyle\sum_{k=1}^{100}(7k+1)$
(b) $\displaystyle\sum_{k=1}^{6}(k-k^3)$
(c) $\displaystyle\sum_{k=1}^{30} k(k-2)(k+2)$

Problem 4. Express the following sums in closed form

(a) $\displaystyle\sum_{k=1}^{n} \frac{3k}{n}$
(b) $\displaystyle\sum_{k=1}^{n-1} \frac{k^2}{n}$
(c) $\displaystyle\sum_{k=1}^{n} \left(\frac{5}{n} - \frac{2k}{n}\right)$

Problem 5. Express the following functions of n in closed form and then find the limit

(a) $\displaystyle\lim_{n\to\infty} \frac{1 + 2 + 3 + \cdots + n}{n^2}$
(b) $\displaystyle\lim_{n\to\infty} \frac{1^2 + 2^2 + 3^2 + \cdots + n^2}{n^3}$
(c) $\displaystyle\lim_{n\to\infty} \sum_{k=1}^{n} \frac{5k}{n^2}$
(d) $\displaystyle\lim_{n\to\infty} \sum_{k=1}^{n-1} \frac{2k^2}{n^3}$

Problem 6. Use the definition of **area under a curve** with x_k^* as the *right* endpoint of each subinterval to find the area under the curve $y = f(x)$ over the specified intervals.

(a) $f(x) = x/2$; $[1, 4]$
(b) $f(x) = 9 - x^2$; $[0, 3]$

Problem 7. Use the definition of **area under a curve** with x_k^* as the *left* endpoint of each subinterval to find the area under the curve $y = f(x)$ over the specified intervals.

(a) $f(x) = 5 - x$; $[0, 5]$
(b) $f(x) = 1 - x^3$; $[-3, -1]$