

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

**Problem 4.** Express the following sums in closed form

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

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

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

**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)  $f(x) = 1 - x^3$ ;  $[-3, -1]$