1. **Evaluating Sums.** Below are some useful summation formulas. Use the formulas along with the sum rules in the notes evaluate the given sums. No need to evaluate.

Let n be a positive integer and c a real number.

$$\sum_{k=1}^{n} c = cn \qquad \sum_{k=1}^{n} k = \frac{n(n+1)}{2}$$

$$\sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6} \qquad \sum_{k=1}^{n} k^3 = \frac{n^2(n+1)^2}{4}$$

(a) $\displaystyle\sum_{k=1}^{75} 2k^2$

(b) $\displaystyle\sum_{i=1}^{20} (n^3 - 2n + 1)$

(c) $\displaystyle\sum_{j=0}^{10} \big(j - 1\big)$

(d) Left Riemann sum of $f(x) = -2x + 2$ on the interval $[0, 1]$ with $n = 20$.

2. **Sigma Notation with Riemann Sums.** Write the following Riemann sums using sigma notation.

(a) The right Riemann sum for $f(x) = x + 1$ on $[0, 4]$ with $n = 50$.

(b) The left Riemann sum for $f(x) = e^x$ on $[0, \ln 2]$ with $n = 40$.

(c) The midpoint Riemann sum for $f(x) = x^3$ on $[3, 11]$ with $n = 32$.

(d) The right Riemann sum for $h(\theta) = 1 + \cos(\pi\theta)$ on $[0, 2]$ with $n = 50$.

3. **Identifying Riemann Sums.**

(a) $\sum_{k=1}^{4} f(1+k) \cdot 1$ is a right Riemann sum for f on what interval and what n number of subintervals?

(b) $\sum_{k=1}^{8} f\left(1.5 + \frac{k-1}{2}\right) \cdot \frac{1}{2}$ is a left Riemann sum for f on what interval and what n number of subintervals?

(c) $\displaystyle\sum_{i=1}^{20}\left((2+i\frac{8}{20})^3+2((2+i\frac{8}{20}))^2-4\right)\frac{8}{20}$ is a right Riemann sum for what function $f(x)$ on what interval and what n number of subintervals?

4. **Approximating Area Under a Curve.** The Riemann sum for f over the interval $[a,b]$ approximates the net change of any antiderivative F of f over $[a,b]$: $F(b)-F(a)$. There are some functions that we cannot find an antiderivative for, like $f(x)=e^{-x^2}$. Approximate the area under e^{-x^2} from $[0,1]$ using a left Riemann sum and larger and larger numbers of subintervals.