Math 261 - Lab 19 **Summation Notation and Area** **Name:** _____

1. Evaluate each sum.

   (a) $\sum_{k=1}^{5} k(k+2)$ (b) $\sum_{k=1}^{24} 5$ (c) $\sum_{k=2}^{5} \frac{2^k}{k}$

2. Which formula is not equivalent to the other two?

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

3. Express each sum in terms of n.

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

4. Express each of the following using summation notation.

   (a) $4 + 10 + 16 + 22 + \cdots + 46$

   (b) $\frac{1}{5} + \frac{2}{6} + \frac{3}{7} + \frac{4}{8} + \cdots + \frac{11}{15}$

   (c) $1 + \frac{x}{2} + \frac{x^2}{3} + \frac{x^3}{4} + \cdots + \frac{x^n}{n+1}$

5. Consider the graph of $f(x) = x^2 + 4$ between 2 and 6.

(a) In the space provided, sketch the graph of $f(x)$, shade in the region under $f(x)$ on the interval $[2, 6]$.

(b) Approximate the area under $f(x)$ on $[2, 6]$ using a right hand sum and 4 rectangles.

(c) Approximate the area under $f(x)$ on $[2, 6]$ using a midpoint sum and 4 rectangles.

(d) Find the exact area under using right-hand endpoints.

(e) Find the exact area under using left-hand endpoints.