AP Calculus AB – Worksheet 51 **Approximating Area Using Riemann Sums**

Approximate areas "under the curve" (between the curve and the *x*-axis) using four subintervals for left, right and midpoint rectangles.

1. $f(x)=x^2$ on $[0,2]$
   a) Left Rectangular Approximation
   b) Right Rectangular Approximation
   c) Midpoint Rectangular Approximation

Approximate areas "under the curve" (between the curve and *x*-axis) using the indicated Riemann Sum.

2. $f(x)=x^3$ on $[0,2]$
   a) Find a Left Rectangular Approximation using four subintervals.
   b) Is the approximation found in part (a) an overestimate or underestimate? Explain how you know in terms of the increasing or decreasing behavior of the graph.

3. $f(x)=1+\cos x$ on $[0,\pi]$
   a) Find a Right Rectangular Approximation using four subintervals.
   b) Is the approximation found in part (a) an overestimate or underestimate? Explain how you know in terms of the increasing or decreasing behavior of the graph.

4. $f(x)=\sqrt{x}$ on $[0,4]$
   a) Find a Right Rectangular Approximation using four subintervals.
   b) Is the approximation found in part (a) an overestimate or underestimate? Explain how you know in terms of the increasing or decreasing behavior of the graph.

5. $f(x)=(x-1)^2$ on $[0,2]$
   a) Find a Midpoint Rectangular Approximation using four subintervals.

6. If $f(x)=\left(x^2-2x-1\right)^{\frac{2}{3}}$, then $f'(0)=$