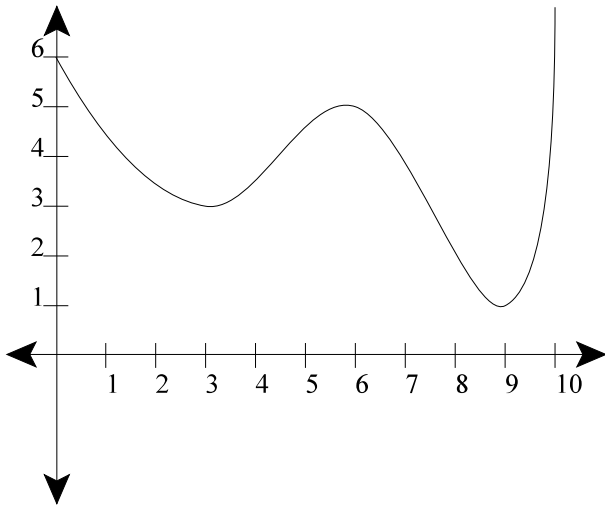


Quiz 12    Calculus 1    11/22/2002

Each problem is worth 5 points. Show complete justification for full credit.

1. By reading values from the graph of  $f(x)$  below, use three rectangles to find an upper estimate and a lower estimate for the area under the graph of  $f(x)$  but above the  $x$  axis between  $x=0$  and  $x=9$ .



2. Use the midpoint rule with  $n=4$  to approximate  $\int_4^8 \sqrt{x^3 - 5x} \, dx$ . [You don't need to simplify your answer – things like  $\sqrt{(4\frac{1}{2})^3 - 5(4\frac{1}{2})}$  are perfectly acceptable here.]