1. (a) Find the number $e$ accurate to 5 decimal places by using Newton’s method to approximate the root of $\ln x - 1 = 0$. Use the initial approximation $x_1 = 1$.
(b) Find an equation you could use to approximate $\pi$ in the same way.

2. Find the most general antiderivative of the function.
   (a) $f(x) = \frac{1}{x} - \frac{1}{x^2}$
   (b) $f(x) = |x|
   (c) $f(x) = \begin{cases} 0, & x \leq 2 \\ 1, & x > 2 \end{cases}$

3. Use four rectangles to estimate the area under the curve $y = 16 - x^2$ from $x = 0$ to $x = 4$, using
   (a) Left endpoints
   (b) Right endpoints
   (c) Middle endpoints

Which of these are underestimates, and which are overestimates?

4. Let $L_{100}$, $R_{100}$ and $M_{100}$ be the estimates using left, right and middle endpoints, for the area under the curve $y = 4x - x^4$ from $x = 0$ to $x = 1$ using 100 rectangles. Without computing the values of $L_{100}$, $R_{100}$ and $M_{100}$, determine which are underestimates and which are overestimates.