Quiz # 9
Math 142.518

Given the function

$$f(x) = x - \ln(x) - 0.1x^2$$

on the interval [0,5], use calculus to:

1. [5 pts] Find all critical points.

   Solution: The critical points are given by

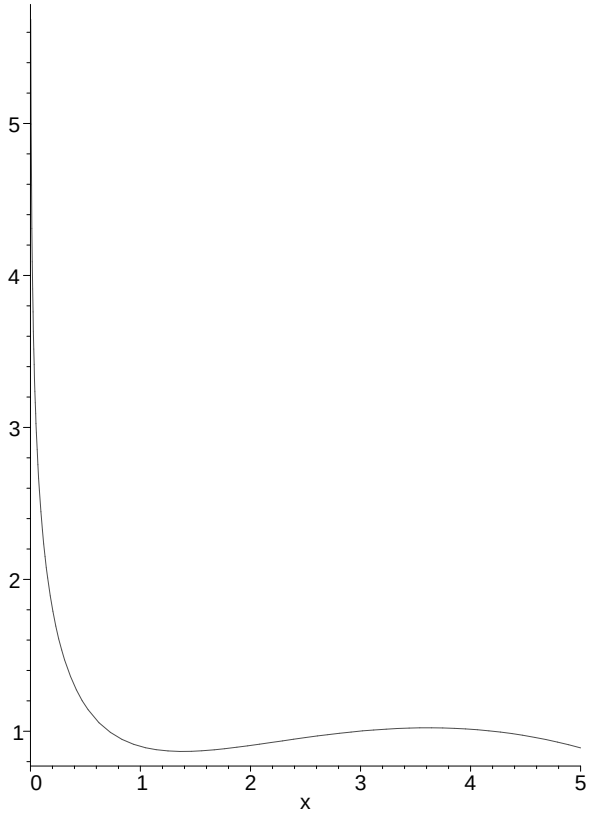
   $$f'(x) = 1 - \frac{1}{x} - 0.2x = \frac{x - 1 - 0.2x^2}{x} = 0$$

   We solve $-0.2x^2 + x - 1 = 0$ using the quadratic formula:

   $$x = \frac{-1 \pm \sqrt{1 - 4(-0.2)(-1)}}{2(-0.2)} = \frac{-1 \pm \sqrt{.2}}{-.4} = 1.381966011, 3.618933989$$

2. [5 pts] Find the location and values of the relative maximum and relative minimum, if they exist.

   Solution:



The values $f(1.381966011) = 0.8674758744$, $f(3.618933989) = 1.023086213$ and $f(5) = 0.890562088$. Therefore the point $x = 1.381966011$ is a relative minimum. The point $x = 3.618933989$ is a relative maximum.

3. [5 pts] Find the location and values of the absolute maximum and absolute minimum, if they exist.

   Solution: The absolute maximum of $f(x)$ occurs at $x = 0$ where $f \to +\infty$. The absolute minimum is the same as the relative minimum, and occurs at $x = 1.381966011$