1. Let $f(x) = \cos(x^2) - x \sin(x)$
   1.1 Find $f'(x)$ by hand.
   1.2 Verify your answer by using Maple to graph $y = f(x)$ and $y = f'(x)$ on the same set of axes on the interval $[-3, 3]$.
   1.3 Also verify your answer by using Maple to differentiate $f(x)$.

2. Repeat #1 with $f(x) = \ln(x^2 + x + 1) + \dfrac{x^3 - 7x}{x^4 + 2x^2 + 11}$

3. Find the maximum and minimum values of

$$f(x) = \ln(x) - \frac{x^2}{20}$$

   on the interval $[1, 12]$.

4. Repeat #3 with $f(x) = x^3 - 5x + 3\sin(x^2)$ on the interval $[-2, 2.5]$.