Week 4 Tutorials

1. Find the derivative of each function and verify by graphing both on the same set of axes

   (a) $f(x) = \sqrt{x} + 3x - x^3 + 2$

   (b) $f(x) = \dfrac{1}{x^2} - x^4$

   (c) $f(x) = \dfrac{1}{\sqrt[3]{x}} + x$

   (d) $f(x) = 3\sin(x) + e^x$

   (e) $f(x) = \ln(x) - 2\cos(x)$

2. (a) Let $g(x) = x^5 - 4x^3 + x^2 + 3x$
   Find $g'(x)$ and $g''(x)$ and verify by graphing all three on the same set of axes

   (b) Let $f(x) = \sin(x) + 6\sqrt[3]{x} - \dfrac{1}{x} + 3e^x$
   Find $f'(x)$ and $f''(x)$ and verify by graphing all three on the same set of axes

   For both these problems, you may need to reposition the window of your graph to see the details.

3. Let $g(x) = 2\cos(x) - \ln(x)$

   (a) Find $g'(x)$

   (b) Apply the IVT to $g'(x)$ to show that $g'(x)$ has a root between $x = 2$ and $x = 4$

   (c) Use your answer to (b) to show that $g(x)$ has a local minimum between $x = 2$ and $x = 4$

4. Let $f(x) = 3x^2 + x - 5$. Find a function $F(x)$ whose derivative is equal to $f(x)$ and verify by graphing both functions on the same set of axes.

   The function F is called an *antiderivative* of f since $F' = f$

5. Find an antiderivative of the function $f(x)$ given in 2(b).