1. **(4 points)** Using two steps of Newton's method with a starting value of $x_0 = 1$, produce an approximation x_2 to a zero of the function $f(x) = x^3 - x + 1$. Your answer need not be arithmetically simplified.

2. **(8 points)** An open-topped box with a square base is being built out of cardboard. You have 48 square feet of cardboard to use. What dimensions maximize the volume of the box?

3. **(8 points)** Answer the following questions

   (a) **(4 points)** What is the antiderivative of the function $f(x) = \frac{4}{x^2} - 2\sqrt{x} + \frac{3}{1+x^2} + \csc^2 x$?

   (b) **(4 points)** If $h'(x) = 2e^x + 3\sin x$, and $h(0) = 6$, what is the formula for $h(x)$?

4. **(2 point bonus)** If $f'(x) = g(x)g'(x)$, and $f(0) = 0$, find and justify a formula for $f(x)$ in terms of $g(x)$.

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