1. A box with an open top is to be constructed from a square piece of cardboard, 3 ft wide, by cutting a square from each of the four corners and bending up the sides. Find the largest volume that such a box can have.

2. The position of a mass on the x axis is given by $x(t) = t(e^t - 2)$ for $t \geq 0$. Find an equation involving a derivative to solve to determine the time when $x(t)$ is at a minimum. You will not be able to solve the equation by hand, so don't sweat it.

3. We can use Newton's method in the previous problem to find an approximate solution.

a. Explain why you expect the minimum to occur somewhere between $t = 0$ and $t = \ln(2) \approx 0.7$.

b. Apply one round of Newton's method to determine an approximate solution starting with $t = 1/2$.

4. Consider the function $G(x) = x^3 - x^2$.

(a) On what intervals is G increasing or decreasing?

(b) Find the locations of any local maximum and minimum values of G.

(c) Find the intervals of concavity and the inflection points.

(d) Sketch the graph of the function including the data already determined.

5. Find the point on the line $y = 3x$ that is closest to the point $(1, 0)$.

6. Find the linearization of $f(x) = \sqrt{x}$ at $a = 4$ and use it to estimate $\sqrt{4.1}$.