



4. Graduation at last! No more math/physics/econ ... academics! Or so you thought. You arrive at your new duty station, immediately deploy and the very first mission you get is to establish the battalion supply point. The commander informs you that the point must be located to supply two units, one at the point (1,4) and the other at point (10,12). He wants you to find a supply point that keeps the total distance from the supply point to these units as small as possible.

(a) Draw a picture to model what is going on. Then define variables and set up your *objective function*.

(b) The supply point must also be placed on the only trafficable trail in the area which is described by the equation

$$y - 6 \cos(0.1y) - 5 \sin(0.05x) - \frac{3}{100,000}x^3 = 20.$$

Plot the trail and use the `Show` command to put it on top of a contour plot of the objective function. Looking at this plot, where is the minimum distance? Using this guess, together with the `FindRoot` command to solve the problem. (Note: `Solve` and `NSolve` can't handle this system!)

*Mathematica Hint:* In your `FindRoot` command, list each of the 3 equations separately, rather than using the `gradf` and `gradg` we developed in yesterday's template.