PROBLEM:

Define $x(t)$ as

$$x(t) = 5\sqrt{2}\cos(20\pi t + \pi/4) + A\cos(20\pi t + \phi) \tag{1}$$

where A is a *positive* number. In addition, assume that $x(t)$ has a phase of zero, so that it may be written as

$$x(t) = B\cos(20\pi t), \tag{2}$$

where B is a *positive* number.

(a) What relationship must exist between A and ϕ in order for $x(t)$ to have zero phase as indicated in Eq. 2?

(b) If $B = 10$, what are the values for A and ϕ?

(c) Now assume that B is unspecified. Find the values for A, B, and ϕ so that the value of A is *minimized*. Draw a plot of the complex amplitudes to prove using a geometrical argument that you have found the minimum for A. *Hint: Recall the geometrical "theorem" that tells you how to find the shortest distance between a line and a point that is not on the line (have you heard the term "projection"?*