Math 254 Exam 7a: 10/31/6

Please read the exam instructions.

Notes, books, papers, calculators and electronic aids are all forbidden for this exam. Please write your answers on **separate paper**, indicate clearly what work goes with which problem, and put your name on every sheet. Cross out work you do not wish graded; incorrect work can lower your grade, even compared with no work at all. Keep this list of problems for your records. Show all necessary work in your solutions; if you are unsure, show it. Extra credit may be earned by handing in revised work in class on Thursday 11/2; for details see the syllabus. Each problem is worth 10 points. You have approximately 30 minutes.

1. Carefully define the term "linear combination".
2. Choose ALWAYS or SOMETIMES or NEVER, for each of the following. Be sure to put your answers on separate paper.
   (a) An inner product space is ___ a vector space.
   (b) A normed space is ___ an inner product space.
   (c) A vector space is ___ an inner product space.
   (d) An inner product space is ___ a normed space.
   (e) A normed space is ___ a vector space.
   (f) A vector space is ___ a normed space.
3. Carefully state the three axioms of an inner product.

   For the next two questions, consider the vector space $P(t)$ with inner product given by $< u, v >= \int_0^1 u(t)v(t)dt$. Let $f(t) = t$, and $g(t) = at + 1$, for some unknown constant a.

4. For which value(s) of a are f and g orthogonal?
5. We want to find which value(s) of a cause f, g to have a 60° angle between them. Set up (but do not solve) an equation in a that would answer this question.
   BONUS: Solve the equation.