Second Examination
Friday, February 25, 2000

Instructions: This exam should be done on your own paper. Your name should be on each sheet and on the back of
the last sheet; the answers should appear written carefully and in order. If in doubt, show intermediate steps: Full credit
may not be given, even for correct answers, unless work is arranged clearly and explained. This exam is closed book.
You may leave after handing in your exam paper, but be sure to check your answers carefully. Each entire problem is
worth 25 points.

1. Write down an equation for the plane perpendicular to the vector $(1,1,1)$ and
   passing through the point $(2,3,4)$.

2. Use a cross product to write down an equation for the plane that passes through
   the points $(1,0,0)$, $(0,1,0)$, and $(0,0,1)$. Show all of your cross product compu-
   tations. Also sketch a graph of the plane.

3. Write down the equation for a tangent plane approximation to the function
   \( f(x,y) = y \cos(\pi x) \) at the point \((x,y) = (1/2,100)\).

4. Consider the function \( f(x,y) = 2x^2 + 3y^4 \).
   (a) Compute the directional derivative of \( f \) at the point \((1,1)\) in the direction
       corresponding to the vector \( \vec{v} = (-1,1) \).
   (b) State, as a unit vector, the direction of maximum decrease in the \( f \) at the
       point \((x,y) = (1,1)\).
   (c) Write down a unit vector parallel to the contour of \( f \) through \((1,1)\).