MTH223 Calculus III Fall 98. Exam I. Name_____

Brain only Part. You may have as long as you like for this portion but I suggest you take no more than 15 minutes. When you have finished, turn in this part to receive the part on which you may use your computational crutch. You may not use your calculator or have it on your desk during this portion of the exam. All problems are worth 8 points. This portion of the exam is 40% of your Exam I grade.

1. State the definition of $f_x(x, y)$.

2. Determine the angle between the vectors $\vec{a} = (-1, 2, 3)$ and $\vec{b} = (1, -2, 3)$. No need to simplify.

3. Write down an equation for the plane containing the points $(1, -2, 3)$, $(-1, -1, 2)$ and $(2, -1, 3)$.

4. Write down an equation for the sphere with center $(1, -2, 3)$ that contains $(-1, -1, 2)$.

5. Sketch 3 level sets and 3 sections by planes perpendicular to the x-axis then sketch the graph of $z = x^2 - y^2$

MTH223 Calculus III Fall 1998. Exam I. Name_____
Brain + Machine Part. Be neat. Show work. All problems are worth the same number of points. Each problem is 15 points. This portion of the exam is 60% of your grade. You may use your calculator on this part.

1) Let $f(x,y) = \begin{cases} \frac{x\,y^2}{x+y^2} & \text{if } (x,y) \neq (0,0) \\ 0 & \text{if } (x,y) = (0,0). \end{cases}$
f is not continuous at $(0,0)$. Use the definition of continuity at (0,0) to explain why not.

2) Assume we know that the function $f(x,y) = x\sin(xy)$ is differentiable at the point $(2, \frac{\pi}{6})$. Find the plane tangent to graph at this point. What is the angle between the plane and the z-axis.

3) A mountains shape is approximated by the surface $f(x,y) = 16 - x^2 - 4y^2$. At what rate is the height of the mountain changing at $(4,1)$ if one is moving through this point along a plane that is perpendicular to the xz-plane.

4) Write down a formula for the volume of the parallelepiped determined by the vectors $\vec{a}$, $\vec{b}$, and $\vec{c}$. Justify, i.e., explain how you know this formula is valid.