Name:______ Score:____

Instructions: Show your work in the spaces provided below for full credit. Use the reverse side for additional space, but clearly so indicate. You must clearly identify answers and show supporting work to receive any credit. Exact answers (e.g., π) are preferred to inexact (e.g., 3.14). Make all obvious simplifications, e.g., 0 rather than $\sin \pi$. Point values of problems are given in parentheses. Point values of problems are given in parentheses. Notes or text in any form not allowed. The only electronic equipment allowed is a calculator.

- (15) **1.** Given points P = (1, -1, 2), Q = (2, 0, -1), R = (0, 2, 1), $\mathbf{a} = \overrightarrow{PQ}$ and $\mathbf{b} = \overrightarrow{PR}$.
- (a) Find $\mathbf{a} \times \mathbf{b}$ and $|\mathbf{a} \times \mathbf{b}|$.

(b) Equation of the plane containing P, Q and R.

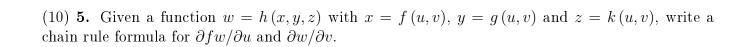
(c) Parametric equations for a line through the point P and parallel to a.

- (15) **2.** Let $f(x,y) = y/x^2$.
- (a) Find the domain and range of f. Are these sets open or closed?

(b) Describe the contour curves of f and plot three of them.

(c) At what points is $f(x, y)$ differentiable?	





- (25) **6.** Let $f(x,y) = \sqrt{x^2 y^2}$.
- (a) Compute the total differential of this function.

(b) Use the differential to estimate the largest possible error in computing f(x, y) at x = 5 and y = 3, given that the error in x could be as large as 0.4 and the error in y could be as large as 0.2.

(c) Compute the linearization L(x,y) of f at (5,3) and use it to approximate f(5,2).