Name:_______ Score:_____

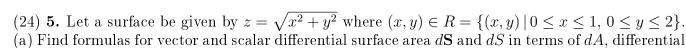
Instructions: Show your work in the spaces provided below for full credit. Use the reverse side for additional space, but clearly so indicate. You must clearly identify answers and show supporting work to receive any credit. Exact answers (e.g., π) are preferred to inexact (e.g., 3.14). Point values of problems are given in parentheses. Notes or text in any form not allowed. Calculator is required.

- (16) **1.** Let $\mathbf{F} = \langle 2x, 2yz^2, 2y^2z \rangle$.
- (a) Show that \mathbf{F} is conservative without actually finding a potential function for \mathbf{F} .

(b) Calculate $\nabla \cdot \mathbf{F}$.

(12) **2.** Let f(t) be a scalar function, $\mathbf{r} = \langle x, y \rangle$ and $r = ||\mathbf{r}|| = \sqrt{x^2 + y^2}$. Show that $\nabla f(r) = f'(r) \frac{\mathbf{r}}{r}$.





surface area in the xy-plane.

(b) Express $\iint_S f(x,y,z)dS$ as an iterated integral in x and y where $f(x,y,z) = \sin(xyz^2)$. Do not work the integral out.

(c) Express $\iint_S \mathbf{F} \cdot d\mathbf{S}$ as a double integral over R, where $\mathbf{F} = \langle x, 0, y^2 z \rangle$. Do not work the integral out.