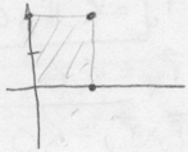
Quiz 7 Calc 3 11/16/2005

1. Parameterize and give bounds for the portion of the surface $f(x,y) = 9 - 2x - y^2$ which lies above the rectangle in the xy-plane with vertices at the origin, (1,0), (1,2), and (0,2).

$x(u,v) = u$ $0 \le u \le 1$

$y(u,v) = v$ $0 \le v \le 2$

$z(u,v) = 9 - 2x - y^2$



5

Great!

2. Parameterize and give bounds for the rectangle in the plane $z = 3$ with vertices (0,0,3), (8,0,3), (8,5,3), and (0,5,3).

$x(u,v) = u$ $0 \le u \le 8$

$y(u,v) = v$ $0 \le v \le 5$

$z(u,v) = 3$

$\vec{r}(u,v) = \langle u, v, 3 \rangle$

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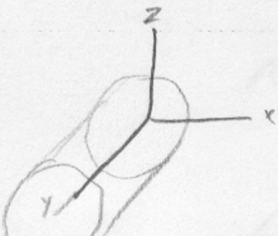
Yes

3. Parameterize and give bounds for the cylinder centered on the y-axis with radius 5 and between the planes y = 2 and y = 8.



$x(u,v) = r\cos u$

$y(u,v) = v$

$z(u,v) = r\sin u$

$0 \le u \le 2\pi$ $2 \le v \le 8$

Nice!

4. Let $\mathbf{F}(x, y, z) = \langle 2x, -z, y \rangle$, and let S be the surface from problem 2 with upward orientation. Evaluate $\iint_S \mathbf{F} \cdot d\mathbf{S}$.

I. $x(u,v) = u$
$y(u,v) = v$ $\quad 0 \le u \le 8$
$z(u,v) = 3$ $\quad 0 \le v \le 5$

$\Big\} \quad \vec{r} = \langle u, v, 3 \rangle$

II. $\vec{F}(\vec{r}(t)) = \langle 2u, -3, v \rangle$

III $\vec{r}_u = \langle 1, 0, 0 \rangle$

$\vec{r}_v = \langle 0, 1, 0 \rangle$

$\begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{vmatrix} = \vec{k}$ ✓

$\vec{r}_u \times \vec{r}_v = \vec{k} = \langle 0, 0, 1 \rangle$

Orientation + = upward so we're good.

IV. $\int_0^5 \int_0^8 \langle 2u, -3, v \rangle \cdot \langle 0, 0, 1 \rangle \, du\,dv$

$\int_0^5 \int_0^8 v \, du\,dv = \int_0^5 [vu]_0^8 \, dv = \int_0^5 8v \, dv$

$= [4v^2]_0^5 = 25(4) - 0 = 100$

Wonderful!