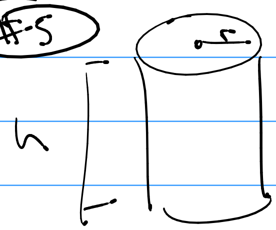
Math 344

Q5 — 95 pts = 100%

#5



$SA = 2\pi r h + 2\pi r^2$

side — ends

$h = 120\text{in} \pm .5\text{in}$

$d = 72\text{in} \pm 1\text{in}$

$r = 36\text{in} \pm 1\text{in}$

$r = 36\text{in} \pm 0.5\text{in}$

$SA = \pi d h + \frac{1}{2}\pi d^2$

$\Delta SA \approx dSA = SA_d \, \Delta d + SA_h \, \Delta h$ ←

$T = 30 + 2\sin(x^2 + y^2)$

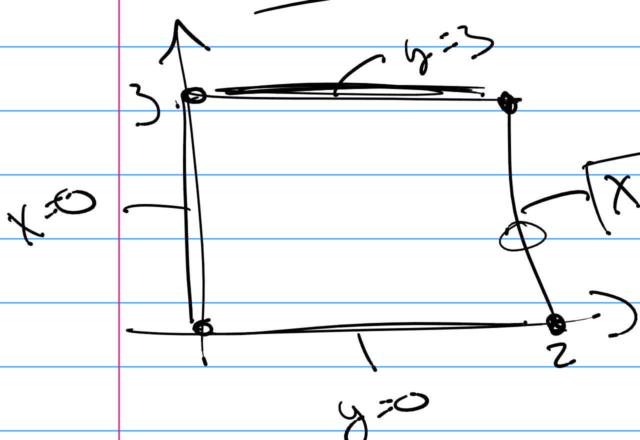
#7 $\nabla T = \langle T_x, T_y \rangle$ @ $(1, 2)$ direction of travel

$|\nabla T(1,2)|$

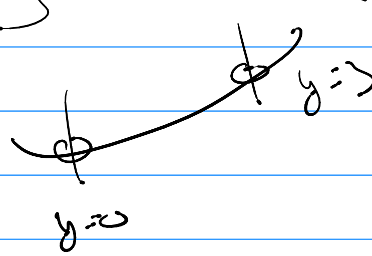
#9 Abs. Extrema

① criticals → just eval $f(x,y)$

② boundry.



Max/min of $f(2, y) = 4 - 2y$



#10 Solve System

$y = 8\lambda x$

$x = 2\lambda y$

$4x^2 + y^2 = 8$

$\lambda = \frac{y}{8x}$ → $x = 2\frac{y}{8x}y$

$4x^2 = y^2$

→ $y^2 + y^2 = 8$ $y^2 = 4$ $y = \pm 2$

#11

$$y = \lambda y$$
$$z + x = \lambda x + 2\mu y$$
$$y = 2\mu z$$
$$xy = 1$$
$$y^2 + z^2 = 1$$

#8 $f = x^4 + y^4 - 4xy$

Criticals: $\begin{cases} f_x = 0 \\ f_y = 0 \end{cases}$ ← System so $\begin{cases} 4x^3 - 4y = 0 \\ 4y^3 - 4x = 0 \end{cases}$

$\begin{cases} x^3 = y \\ y^3 = x \end{cases}$ ⇒ $(x^3)^3 = x$ → $x^9 = x$

$x^9 - x = 0$ → $x(x^8 - 1) = 0$

$x(x^4 - 1)(x^4 + 1) = 0$

$x(x^2 - 1)\cancel{(x^2 + 1)}\cancel{(x^4 + 1)} = 0$

$x = 0$ $\quad x = 1$ $\quad x = -1$

$y = 0$ $\quad y = 1$ $\quad y = -1$

test

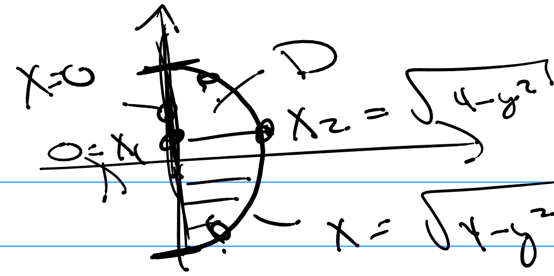
$D = ?$

(0,0) } saddle

(1,1), (-1,-1) } min

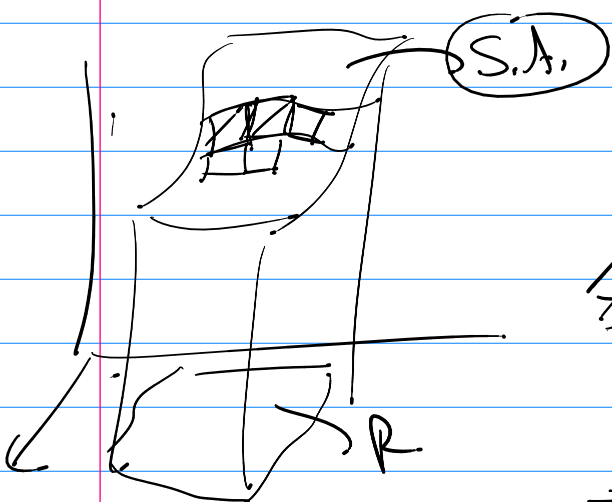
Evaluate the double integral.

$\iint_D 8xy^2\, dA$, D is enclosed by $x = 0$ and $x = \sqrt{4 - y^2}$



$$\int_{-2}^{2} \left[\int_{0}^{\sqrt{4-y^2}} 8xy^2 \, dx \right] dy$$

15.5 Surface Area.

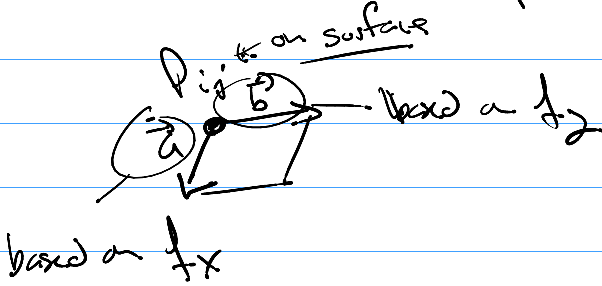


$$SA = \iint_R \Delta S_{ij} \, dA$$

ΔT_{ij} (tangent plane)

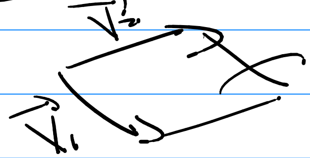
→ SA = Sum of pieces of tangent planes $\Delta x, \Delta y \to 0$

$\Delta T_{ij} = ?$



$\vec{a} = \langle \Delta x, 0, f_x \Delta x \rangle$ $\quad \vec{b} = \langle 0, \Delta y, f_y \Delta y \rangle$

Def of cross product



area of the parallelogram = $|\vec{V_1} \times \vec{V_2}|$

SOS $\Delta T_{ij} = |\vec{a} \times \vec{b}|$

$$\vec{a} \times \vec{b} = \langle -f_x \Delta x \Delta y, -f_y \Delta x \Delta y, \Delta x \Delta y \rangle$$

($\Delta x \Delta y = \Delta A$)

$$\vec{a} \times \vec{b} = \langle -f_x, -f_y, 1 \rangle \Delta A$$

$$\Delta T_{ij} = \sqrt{1 + f_x^2 + f_y^2}\, dA$$

$$SA = \iint_R \sqrt{1 + (f_x)^2 + (f_y)^2}\, dA$$