Mo Tu We Th Fr Sa Su	Memo No
Unit 4 2025.121. Triple In and Grindrical Coordin	ntegrals: Rectingular
Trible Integral	
	Sext dv Gex: dxdydz
Example: region betwee	an paraboloids $\begin{cases} 2=x^2+y^2 \\ 2=4-x^2-y \end{cases}$
volume III 1 dv	top?
= / [ / 5x (4-x-y) d= dydx  Find shadow in xy-plane?	all (x,y) in the shad
Where $\geq 6uttom < 2 twp$ $(x^2+y^2 < 4-x^2+y^2)$	15-5-X
shadow = X+y2<2 dis	s of radius 52

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Better: US polar coordinates instead of xy  Inner: $\int_{x^2+y^2}^{4x^2} dt = [-\frac{1}{2}]_{x^2+y^2}^{4-x^2-y^2} = 4-2x^2-y^2$ $\int_{x^2}^{2} \int_{x^2}^{5x^2} (4-2x^2-y^2)^2 dydx = \int_{x^2+y^2}^{2} \int_{x^2}^{4x^2} \int_{x^2}^{4x^2} dt d\theta$ (easier to evaluate)  this called <u>cylindfical</u> coordinates  oylindrical $(r,0,\frac{1}{2})$ $x = r\cos\theta$ , $y = r\sin\theta$ $x = r\cos\theta$ , $y = r\sin\theta$ Applications: $-\cos\theta$ ; density $\delta = \frac{\sin\theta}{av}$ $dm = \delta \cdot av$ mass = $\int_{x^2+y^2}^{4x^2-y^2} dt d\theta$ (easier to evaluate) $dm = \delta \cdot av$ $dm = \delta \cdot av$	Date /
Inner: $\int_{x^2+y^2}^{x+y^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{x+y^2} = 4-2x^2-2y^2$ $\int_{\pi}^{\pi} \int_{\pi}^{\pi} \frac{1}{x^2} dt = [\pm 1]_{x^2+y^2}^{$	Better: use polar andinates instead of my
This called eylindrical coordinates  this called eylindrical coordinates $(r,0,2)$ $x=r cos 0$ , $y=r sin 0$ Note: $r=a$ (radius), $r>0$ .  Applications: - Mass; density $\delta = \frac{am}{aV}$ $dm = \delta \cdot AV$ mass = $\iint_R S dV$ - Average value of $f(x,y,2)$ in $R$ :	Inner: (4-xy) = [ + ] x+y== 4-2x=-2y=
this called eylindfical coordinates  ordinates  ordinates  ordinates $(r,0,\pm)$ $x=r\cos\theta$ , $y=r\sin\theta$ $x=r\cos\theta$ , $y=r\sin\theta$ Note: $r=a$ (radius), $[r>0]$ $x=r\cos\theta$ , $y=r\sin\theta$ $x=r\cos\theta$ $x=r\cos\theta$ , $y=r\sin\theta$ $x=r\cos\theta$	1 fix 4-2x20-2y2 dydx = ) Switch to post pt polar an
this called eylindrical coordinates  ordinarical $(r,0,\pm)$ $x=r\cos\theta$ , $y=r\sin\theta$ $x=r\cos\theta$ , $y=r\sin\theta$ Note: $r=a$ (radius), $[r>0]$ $x=r\cos\theta$ , $y=r\sin\theta$ $x=r\cos\theta$ $x=r\cos\theta$ , $y=r\sin\theta$ $x=r\cos\theta$	= (2to /2 /4-r2)
Applications: - Mass; density $\delta = \frac{\Delta m}{\Delta V}$ $\Delta m = \delta \cdot \Delta V$ Average value of $f(x,y,\pm)$ in $g(x,y)$ in $g(x)$	
Applications: - Mass; Jensity $S = \frac{\Delta m}{\Delta V}$ mass = $\iint_{R} S dV$ -Average value of $f(x,y,\pm)$ $mR$ :	
Applications: $-Mass$ ; density $\delta = \frac{\Delta m}{\Delta V}$ $dm = \delta' \Delta V$ Average value of $f(x,y, \pm)$ $mR$ :	///12
Applications: $-Mass$ ; density $S = \frac{\Delta m}{\Delta V}$ $dm = S \cdot \Delta V$ Average value of $f(x,y,\pm)$ in $R$ :	/or v
Applications: - Mass; density $\delta = \frac{\Delta m}{\Delta V}$ $dm = \delta \cdot \Delta V$ $mass = II_R \delta dV$ - Average value of $f(x,y,\pm)$ mig:	X
Applications: - Mass; Jensity $\delta = \frac{\Delta m}{\Delta V}$ $dm = \delta' \Delta V$ $mass = II_R \delta dV$ -Average value of $f(x,y,\pm)$ in R:	/ 4.3
$dm = \delta \cdot av$ $mass = \iint_{R} \delta dV$ -Average value of $f(x, y, \pm)$ in $R$ :	
$dm = \delta \cdot av$ $mass = \iint_{R} \delta dV$ -Average value of $f(x, y, \pm)$ in $R$ :	
$dm = \delta \cdot av$ $mass = \iint_{R} \delta dV$ -Average value of $f(x, y, \pm)$ in $R$ :	Applications: - Mass: Jone New S = am
mass = $M_R S dV$ -Average value of $f(x,y, \pm)$ in R:	
- Average value of f(x,y, z) mx:	
$\tilde{\mathcal{E}} = \frac{1}{1600} \left( \frac{1}{1600} \right) \frac{1}{1600} $	
1 - (n)(0) 1/10 TaV	$\hat{f} = \overline{w(w)} \iint R f dV$
or, with density (weighted ang) mass(R) [] x f8d1	

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- Center of mas:  $(\bar{x}, \bar{y}, \bar{z})$   $\bar{x} = mass \iiint_R X S dV$   $y, \bar{z}$  as some

- Moment of mertia: /axis  $(m \cdot r')$   $\iiint_R (distance to axis)^2 S dV$   $I_{\bar{z}} = \iiint_R r^2 S dV = \iiint_R (x^2 + y^2) S dV$   $I_{\bar{x}} = \iiint_R y^2 + z^2 S dV$   $I_{\bar{x}} = \iiint_R x^2 + z^2 S dV$ Example 2:  $I_{\bar{z}} = \int \int r^2 r dr d\theta d\bar{z}$   $I_{\bar{z}} = \int \int r^2 r dr d\theta d\bar{z}$   $I_{\bar{z}} = \int \int r^2 r dr d\theta d\bar{z}$   $I_{\bar{z}} = \int \int r^2 r dr d\theta d\bar{z}$   $I_{\bar{z}} = \int \int r^2 r dr d\theta d\bar{z}$   $I_{\bar{z}} = \int \int r^2 r dr d\theta d\bar{z}$   $I_{\bar{z}} = \int \int r^2 r dr d\theta d\bar{z}$   $I_{\bar{z}} = \int r^2 r dr d\theta d\bar{z}$ 

Examples: set up SSS for region to 1-y inside

Zi of unit bull centered out Origin

