

Exam III review sheet for math 267

3 Do the following make sense? If so, what do they represent?

- (a) Does not make sense.
- (b) The volume of the solid under the plane $z = x$ above the region $D = \{(x, y) | 1 \leq y \leq 2, 0 \leq x \leq 4\}$.
- (c) Same as part (b)
- (d) The volume of the solid between the plane $x = z$ and the region in the yz -plane given by $D = \{(y, z) | 1 \leq y \leq 2, 0 \leq z \leq 4\}$.
- (e) Does not make sense.

7 $\frac{(\sqrt{32})^3}{3} 2\pi(1 - \frac{\sqrt{2}}{2})$.

8 Consider the area A of the region of the ellipse $\frac{x^2}{9} + y^2 = 1$ that lies in the first quadrant. The line $y = mx$ divides this region into two areas A_1 and A_2 .

- (a) $x = 3u, y = v$.
- (b) Equation of boundary is $v = 3mu$.
- (c)

$$\text{Area}(A_1) = \iint_{B_1} \left| \frac{\partial(x, y)}{\partial(u, v)} \right| du dv = \iint_{B_1} 3 du dv = 3\text{Area}(B_1)$$

$$\text{Area}(A_2) = 3\text{Area}(B_2).$$

(d) $m = \frac{1}{3}$.

9 $(2\sqrt{2} - 1)\pi$.

10 (a)

$$\int_{-\frac{3\sqrt{2}}{2}}^{\frac{3\sqrt{2}}{2}} \int_{-\sqrt{\frac{9}{2}-y^2}}^{\sqrt{\frac{9}{2}-y^2}} \int_{\sqrt{x^2+y^2}}^{\sqrt{9-x^2-y^2}} (x + y + z) dz dx dy.$$

(b)

$$\int_0^{2\pi} \int_0^{\frac{\pi}{4}} \int_0^3 [\rho \sin(\phi) \cos(\theta) + \rho \sin(\phi) \sin(\theta) + \rho \cos(\phi)] \rho^2 \sin(\phi) d\rho d\phi d\theta.$$

(c)

$$\int_0^{2\pi} \int_0^{\frac{3\sqrt{2}}{2}} \int_r^{\sqrt{9-r^2}} r^2(\cos(\theta) + \sin(\theta)) + rz dz dr d\theta.$$

11 27π .

12 $(\ln 7 - \ln 16 + 9)\pi$

13 $\int_0^{2\pi} \int_1^2 \int_1^{\sqrt{2}} z r^2 dr dz d\theta = (2\sqrt{2} - 1)\pi$.

19 $-\frac{3\pi}{2}$.

20 Same as 19.

21 $f(x, y) = (x^2 + y^2)/2$

22 No potential function.

24 Say that \mathbf{F} is a vector field. Do the following make sense? If so, are they vectors or scalars?

- (a) Scalar (b) Does not make sense (c) Does not make sense
- (d) Scalar (e) Vector (f) Vector