

MATH 237 EXAM 3 REVIEW SHEET NOVEMBER 15, 2016

MATERIAL : Tangent Planes and Normal Lines, Double Integrals, Triple Integrals, 13.1-13.3,13.5,13.6

1. Give the tangent plane and normal line to the surface at the given point.

(a) $z = xe^{-x^2-y^2}$; (1,0) (b) $4x^2 + 9y^2 + 36z^2 = 36$; $(1, -1, \frac{\sqrt{26}}{3})$

(c) $z = x^2 + xy + 2y^2 + 7x + 7y + 15$; (-3,-1) (d) $z = e^{-(x-2)^2-(y+4)^2}$; (2,-4)

2. Give the tangent plane to $4xy - x^4 - x^2y^4 - z = 0$ whose normal is given by the line

$$x = y - 2 = \frac{z+1}{4}.$$

3. Give the average values of the following functions over the regions given.

(a) $z = |x^2 - y^2|$; $Q = \{(x, y) \mid -2 \leq x \leq 2; -2 \leq y \leq 2\}$

(b) $z = |4x + y|$; $Q = \{(x, y) \mid -1 \leq x \leq 3; 0 \leq y \leq 4\}$

(c) $z = x - 2y$; $Q = \{(x, y) \mid 0 \leq x \leq 4; x^2 \leq y \leq 4x\}$

4. Draw the region for each of the integrals and give the value of the integral.

(a) $\int_{-2}^2 \int_1^4 x^2 y \, dx dy$ (b) $\int_1^4 \int_{2x}^{4x} 5 \, dy dx$ (c) $\int_0^1 \int_0^{4y^2} ye^{-x^2} \, dx dy$ (d) $\int_0^1 \int_{x^2}^{\sqrt{x}} \cos y \, dy dx$

(e) $\int_0^1 \int_0^{\sqrt{1-y^2}} e^{-x^2-y^2} \, dx dy$ (f) $\int_{-2}^2 \int_0^{\sqrt{4-y^2}} \sin \sqrt{x^2 + y^2} \, dx dy$ (g) $\int_{-1}^2 \int_0^3 x \sin(xy) \, dx dy$

(h) $\int_0^1 \int_{x\sqrt{3}}^{\sqrt{4-x^2}} (x^2 + y^2) \, dy dx$

5. Give the volumes. (a) inside $z = 8 - x^2 - y^2$ and outside $z = x^2 + y^2$ (b) bounded by

$x = 0, y = 0, z = 0$ and $x + y + z = 1$ (c) bounded by $x = -2, x = 2, z = 4 - 2y$ and $z = 4 - y^2$

(d) inside the sphere $\rho = 1$ and the cone $z = r$ (e) bounded by $y = 4x$ and $y = x^2$ and whose height is given by $z = xy$.

6. BP: Due Monday November 14, 2016 at beginning of class. Give $\int_0^3 \int_{-1}^1 xe^{-3xy} \, dx dy$ both ways.