

Calculus III

Homework on Lecture 13

1. Evaluate the double integral.

- (a) $\iint_D x^3 y^2 dx dy$, $D = \{(x, y) | 0 \leq x \leq 2, -x \leq y \leq x\}$.
- (b) $\iint_D \frac{4y}{x^3 + 2} dx dy$, $D = \{(x, y) | 1 \leq x \leq 2, 0 \leq y \leq 2x\}$.
- (c) $\iint_D \frac{2y}{x^2 + 1} dx dy$, $D = \{(x, y) | 0 \leq x \leq 1, 0 \leq y \leq \sqrt{x}\}$.
- (d) $\iint_D e^{y^2} dx dy$, $D = \{(x, y) | 0 \leq y \leq 1, 0 \leq x \leq y\}$.
- (e) $\iint_D x \cos y dx dy$, D bounded by $y = 0$, $y = x^2$, $x = 1$.
- (f) $\iint_D (x + y) dx dy$, D bounded by $y = \sqrt{x}$ and $y = x^2$.
- (g) $\iint_D y^3 dx dy$, D - triangle with vertices $(0, 2)$, $(1, 1)$, $(3, 2)$.
- (h) $\iint_D xy^2 dx dy$, D enclosed by $x = 0$ and $x^2 + y^2 = 1$.
- (i) $\iint_D (2x - y) dx dy$, D bounded by circle with radius 2 centered at the origin.
- (j) $\iint_D 2xy dx dy$, D - triangular region with vertices $(0, 0)$, $(1, 2)$, $(0, 3)$.

2. Evaluate the double integral. The answer key has not been proofread, use with caution.

- (a) $\iint_{\mathcal{R}} xy dx dy$ where \mathcal{R} is bounded by the curves $x = 3$, $x + 1 = y^2$, $x = y^2 + 2y + 3$.
- (b) $\iint_{\mathcal{R}} xy dx dy$.
where \mathcal{R} is the region enclosed by $y = x^2 + 1$ and $y = 2x^2 - x - 1$.

3. Integrate.

- (a) $\int_{y=0}^{y=\sqrt{\pi}} \int_{x=y}^{x=\sqrt{\pi}} \cos(x^2) dx dy$.
- (b) $\int_{y=0}^{y=1} \int_{x=\sqrt{y}}^{x=\sqrt[5]{y}} e^{-x^3} dx dy$.