Exercises with Maxima/wxMaxima. You should reproduce all the demonstrations of wx-Maxima example in class from Section 15.1 and 15.2. Then complete the following problems and verify your answers with Maxima/wxMaxima.

1. Evaluate the following double integrals.

(a)
$$\iint_{R} xy\sqrt{x^{2} + y^{2}} dx dy \text{ where } R = \{(x, y) : 1 \le x \le 2, 1 \le y \le 2\}.$$

(b)
$$\iint_{R} \frac{1 + x^{2}}{1 + y^{2}} dx dy \text{ where } R = [0, 1] \times [0, 1].$$

(c)
$$\iint_{R} (4 + x^{2} - y^{2}) dx dy \text{ where } R = \{(x, y) : -1 \le x \le 1, 0 \le y \le 2\}.$$

2. Evaluate the following iterated integrals. Beware of the order of iterations.

(a)
$$\int_{0}^{1} \int_{0}^{x^{2}} \frac{y}{x^{5}+1} dy dx$$

(b) $\int_{0}^{1} \int_{0}^{y} x \sqrt{y^{2}-x^{2}} dx dy$

3. Evaluate the following double integrals.

(a)
$$\iint_D (x+y)dxdy$$
 where D is bounded by $y = x^2$ and $y = \sqrt{x}$.
(b) $\iint_D 2xydxdy$ where D is bounded by $y = 2x$, $y = 3 - x$, and $x = 0$.

Online quiz No.6: Complete online quiz at the course website.

Key formulas to memorize:

1. Fubini theorem: $R = \{(x, y) : a \le x \le b, c \le y \le d\}$ is a rectangular region.

$$\iint_{R} f(x,y) \, dx \, dy = \int_{a}^{b} \left[\int_{c}^{d} f(x,y) \, dy \right] \, dx = \int_{c}^{d} \left[\int_{a}^{b} f(x,y) \, dx \right] \, dy$$

2. $D = \{(x, y) : a \le x \le b, g(x) \le y \le h(x)\}$ is a region of type I.

$$\iint_D f(x,y) \, dx \, dy = \int_a^b \left[\int_{g(x)}^{h(x)} f(x,y) \, dy \right] \, dx$$

3. $D = \{(x,y) : c \le y \le d, g(y) \le x \le h(y)\}$ is a region of type II.

$$\iint_D f(x,y) \, dx dy = \int_c^d \left[\int_{g(y)}^{h(y)} f(x,y) \, dx \right] dy$$