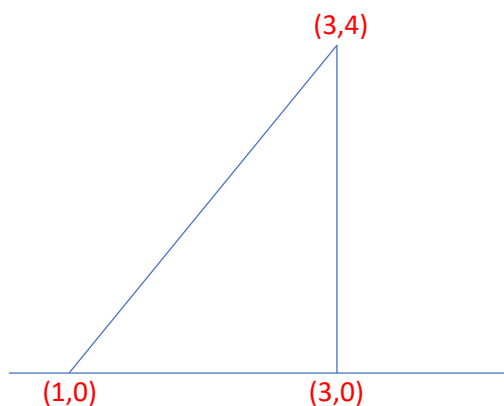


HW#06

- I. Find the volume common to the cylinders $x^2 + y^2 = a^2$ and $x^2 + z^2 = a^2$.
- II. Evaluate $\iint_D \frac{\sin x}{x} dA$, where D is the region bounded by $y = x$, $x \geq 0$ and $x = 1$.
- III. Sketch the three Petal rose $r = \sin 3\theta$.
- IV. Find the area of one Petal of the three Petal rose $r = \sin 3\theta$.
- V. Convert the integral $\iint_D y\sqrt{x^2 + y^2} dA$ where $D = \{(x, y): 0 \leq x \leq 1, 0 \leq y \leq x\}$, into polar coordinates and evaluate it.
- VI. The population density of Gladstone city is given by $P(x, y) = 2x^2 + 5y$, where x and y are in miles and P is the number of people per square mile, in thousands. The city limits are as shown in graph below.
 - a) determine the city's population
 - b) determine the average number of people per square mile of the city



- VII. The total force on the dam is given by surface integral $\int_A k(h - y)dA$
 Imagine that the dam is rectangular in profile with a width of 100m and a height h of 40m. The constant k is assumed to be $10^4 \text{ kg m}^{-2} \text{ s}^{-2}$. Construct the double integral and then use it to find total force on dam.
- VIII. A building is to have a curved roof above a rectangular base. In relation to a rectangular grid, the base is the rectangular region $-30 \leq x \leq 30$, $-20 \leq y \leq 20$, where x and y are measured in meters. The height of the roof above each pt. (x, y) in the base is given by $h(x, y) = 12 - 0.003x^2 - 0.005y^2$
 - a) Find volume of the building
 - b) Find the average height
- IX. The total force on the dam is given by surface integral $\int_A k(h - y)dA$
 Imagine that the dam is rectangular in profile with a width of 200m and a height h of 80m. The constant k is assumed to be $10^6 \text{ m}^{-2} \text{ s}^{-2}$. Find total force on dam.
- X. A biomass covers the triangular bottom of the container whose region is bounded by the x -axis and the line $x + y = 6$. The depth $h(x, y) = \frac{x}{y+2}$ at each pt. (x, y) in the region is given. All dimensions are in cm. What is the total volume of biomass?

