

Do not forget to write
your full name and
your Bilkent ID number, and
sign on the upper right corner
of your paper.

Final Exam Question 4.

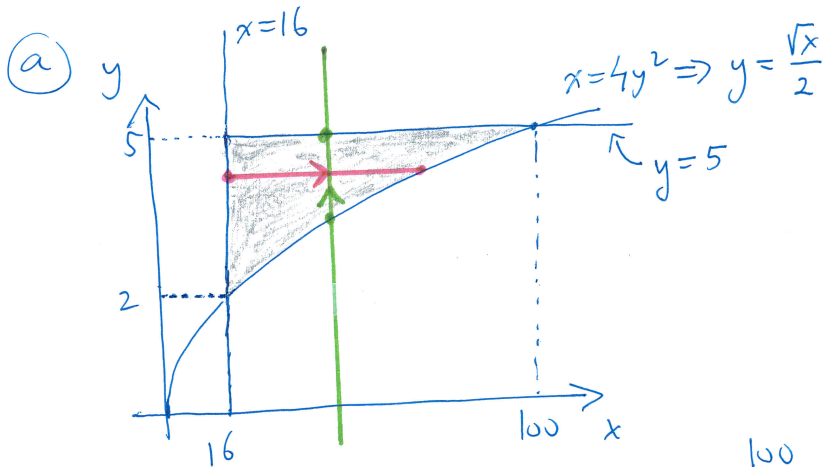
a. Change the order of integration in the iterated integral $\int_2^5 \int_{16}^{4y^2} f(x,y) dx dy$.

b. Express the double integral $\iint_D f(x,y) dA$ as an iterated integral in polar coordinates where $D = \{(x,y) : x^2 + y^2 \leq 2x \text{ and } x + \frac{y}{\sqrt{3}} \geq 1\}$.

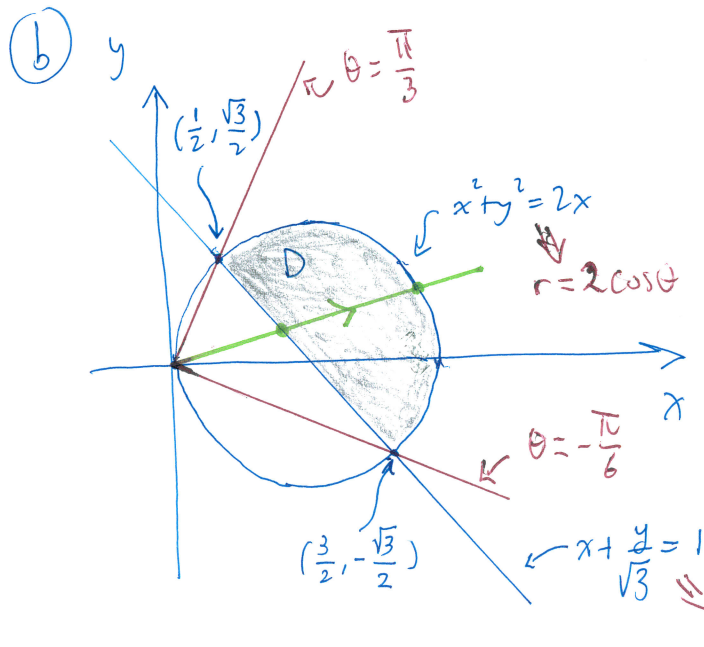
In this question you might want to use: $x = r \cos \theta$, $y = r \sin \theta$, $dx dy = r dr d\theta$

Show all your work!

Explain your reasoning fully and in detail using correct mathematical notation and terminology, and in well-formed mathematical and English sentences!



$$\int_2^5 \int_{16}^{4y^2} f(x,y) dx dy = \iint_D f(x,y) dA = \int_{16}^{100} \int_{\sqrt{x}/2}^5 f(x,y) dy dx$$



$$\iint_D f(x,y) dA = \int_{-\pi/6}^{\pi/3} \int_{1/(\cos\theta + \frac{\sin\theta}{\sqrt{3}})}^{2\cos\theta} f(r\cos\theta, r\sin\theta) r dr d\theta$$