# Exam #3

ⓘ This is a preview of the published version of the quiz

Started: Apr 25 at 3:20pm

# Quiz Instructions

Exam #3

Exam #3

The following is Exam #3. You will have until Wednesday, February 9th at 11:59 PM to complete this exam. Please complete this exam on separate paper or on a tablet. Clearly indicate the question number for each question. Please show all work and clearly indicate your answers. Remember, this exam is an opportunity for you to demonstrate what you know. It is acceptable to use your notes. I understand that there may be discussions, which I am not opposed to. Just please do not simply give away answers. Also, please do not use any online resources or websites to request others to do questions for you. It is fine for you to visit my office hours or send me an email to ask me questions.

For this exam, do not click on "Submit". Once you do, you will not be able to access the exam again. You can simply close your web browser when you are finished working for the moment.

When you are ready to submit your exam, you will not submit the exam to this assignment. You will submit your exam through the "**Exam #3 Submission**" assignment. This assignment can be found under the Assignments menu option to your left. You can use a device to scan your exam.

---

(7 points) 1. Find the dimensions of the box with volume 1000 cm$^3$ that has minimal surface area.

(7 points) 2. Use Lagrange multipliers to determine the maximum and minimum values of $f(x, y, z) = x + 2y + 3z$ subject to the constraint $g(x, y, z) = x^2 + y^2 + z^2 = 25$.

(5 points) 3. Estimate $\int\int_R (3xy^2 + 4x^2y)\, dA$ where $R = [0,1] \times [0,1]$ by dividing $R$ into four equal squares and evaluating the function at the upper right corner of each square.

(7 points) 4. Find the volume under the surface $z = x^2 + y^2$ and above the region in the xy-plane enclosed by the triangle enclosed by the lines $y = x$, $x = 0$, and $x + y = 2$ in the $xy$-plane.

(7 points) 5. Find the average value of the function $f(x, y) = x^2y$ over the region bounded by the lines $x = 4$ and $y = 2$ in the first quadrant.

(7 points) 6. Use a double integral to find the volume of the solid region under the plane $2x + y + z = 4$ and above the disk $x^2 + y^2 \leq 1$.

(7 points) 7. Sketch the region of integration, reverse the limits of integration, and then integrate: $\int_0^2 \int_{y/2}^1 y\cos(x^3 - 1)\, dx\, dy$

(7 points) 8. Use a double integral to find the area inside one leaf of $r = 4\cos 3\theta$.

(7 points) 9. Use a triple integral to find the volume of the tetrahedron enclosed by the coordinate planes and the plane $2x + 4y + z = 8$.

(7 points) 10. Use cylindrical coordinates to evaluate $\int\int\int_E yz\, dV$ where E lies above the plane $z = 0$, below the plane $z = y$, and inside the cylinder $x^2 + y^2 = 4$ .

(7 points) 11. Use spherical coordinates to evaluate $\int\int\int_E y^2\, dV$, where E is the solid hemisphere $x^2 + y^2 + z^2 \leq 9$, $y \geq 0$.

12. Given the region D bounded by $y = x + 2$ and $y = x^2$. If the region has the density function $\rho(x, y) = x^2$, set up the integrals that would determine the following. Do not evaluate the integrals.

(2 points) a. $M_x$

(2 points) b. $M_y$

(2 points) c. $M$

(2 points) d. $I_x$

(2 points) e. $I_y$