

Math 2233 Summer 2026
Multivariable Calculus
Mastery Quiz 7 Worksheet
Due Wednesday, July 22

This week's mastery quiz has two topics.

Remember that you are trying to demonstrate that you understand the concepts involved. For all these problems, you should justify your answers and show your work. Do not just write “yes” or “no” or give a single number.

On Wednesday, we will end class with a short quiz, containing questions drawn from this worksheet. You may not use or consult any materials or notes during Wednesday's quiz; make sure you work through these problems carefully, and understand them well enough that you can replicate that work in class.

Topics on This Quiz

- Major Topic 3: Optimization
- Major Topic 4: Integration

Name:

M3: Optimization

- (a) Find (but don't classify) the critical points of $g(x, y, z) = x^2 + y^2 + 3z^2 - 2x - 8y - z^3 + 5$.
- (b) Find the maximum and minimum values of $f(x, y) = xy$ subject to the constraint that $x^2 + 4y^2 \leq 1$.

M4: Integration

- (a) Use a change of variables to integrate the function $(x + y)(x - y)$ over the diamond bounded by $x + y = 2, x + y = 0, x - y = 0, x - y = 2$.
- (b) We want to integrate the function $f(x, y, z) = (x^2 + y^2 + z^2)^{3/2}$, over the region enclosed by the cone $z = \sqrt{3x^2 + 3y^2}$ and the sphere $x^2 + y^2 + z^2 = 16$. Set up three different iterated integrals to compute this, in cartesian, cylindrical, and spherical coordinates. Choose one of the integrals you set up and evaluate it.