

Math 2233 Summer 2026
Multivariable Calculus
Mastery Quiz 2 Worksheet
Due Monday, July 6

This week's mastery quiz has three topics. Everyone should prepare M1 and S2. You may or may not still need to prepare S1, but I encourage everyone to work through it to compare to the solutions that will be posted later.

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 1: Vector Functions
- Secondary Topic 1: Vectors
- Secondary Topic 2: Vector Functions

Name:

Name: _____

M1: Vectors

(a) Find a *unit* vector perpendicular perpendicular to both $\vec{v} = 3\vec{i} - 2\vec{j} + 5\vec{k}$ and $\vec{w} = 7\vec{j} + \vec{k}$.

(b) Find the orthogonal decomposition of $\vec{v} = 6\vec{i} + 2\vec{j} - 3\vec{k}$ with respect to $\vec{u} = 2\vec{i} + \vec{j} + 2\vec{k}$.

(c) Find a vector from the point $P = (1, -5, 2)$ to the point $Q = (-2, 1, 4)$.

Name: _____

S1: Lines and Planes

- (a) Find an equation for the plane that passes through the points $(-1, 1, 8)$, $(3, 0, -1)$, and $(2, 2, 3)$.

- (b) Find an equation for the plane that passes through the points $(1, 4, 2)$, $(3, 2, 2)$, and $(7, 1, 5)$.

- (c) Find a vector perpendicular to the plane given by the equation

$$z = 5 - 4(x - 2) + 7(y - 3).$$

Name: _____

S2: Vector Functions

- (a) Find a (parametric) equation for the line tangent to the curve $\vec{r}(t) = (\sin(t^2), e^t, (t + 1)^4 - 2)$ at the time $t = 0$.
- (b) If a particle moves with velocity $\vec{v}(t) = \langle 6t, \cos(\pi t/2) \rangle$ then what is the displacement between times $t = 1$ and $t = 4$?
- (c) Suppose a particle is at position $(3, 1, -1)$ at time $t = -1$ and has velocity vector $\vec{v}(t) = \cos(\pi t/6)\vec{i} + \sin(\pi t/6)\vec{j} + 2t\vec{k}$. Where is the particle at time $t = 3$?