

Rules for the Exam

No calculators. They will not be needed. Your formula card can be a $8\frac{1}{2} \times 11''$ piece of paper. It can have writing on two sides.

Review Questions

How do you switch a set of parametric equations to a Cartesian equation? (Think of two ways)

What are good questions to think about when graphing parametric equations?

How can we compute the slope of the tangent line of a parametric curve?

When is the tangent line horizontal? When is it vertical?

How can we compute the area under a parametric curve? (Think of a formula and focus on the limits of integration.)

What is the arc length formula?

What are the three types of conic sections? What do their equations look like?

What is the equation for a sphere?

What is the distance formula in 3D?

What is a vector?

What is a geometric meaning for the sum of two vectors?

When are two vectors parallel?

What is a scalar?

What is a unit vector? What is the unit vector in the direction of \vec{a} ?

What is the scalar (or dot) product? (How is it computed? Is it a vector or a scalar?)

Give a formula relating scalar product and $\cos \theta$.

How can we use the scalar product to check if two vectors are perpendicular?

What is the cross product? (How is it computed? Is it a vector?)

Give three properties that are special and relate to $\vec{a} \times \vec{b}$.

What can we say about $|\vec{a} \times \vec{b}|$?

Give three types of equations for a line.

Give two equations for a plane.

Explain what it means for two lines to be skew, parallel, or intersecting.

If two lines intersect how can we find the angle between them? What is a good way to check to see if intersecting lines are perpendicular?

How can we find the point of intersection given the equations for two lines?

How can a line and a plane intersect?

How can we compute the distance from a point to a plane?

What does it mean for a graph to be a cylinder? Why is $z = y^3$ a cylinder?

What are the quadratic surfaces? What are their equations?

How can we tell the quadratic surfaces apart?

Explain what a trace is.

What is a vector valued function? How can we graph it?

How can we take a derivative of a vector valued function?

What is a geometric interpretation of the derivative?

How can we compute a tangent line to $\vec{f}(t)$ using the derivative?

What is the integral of a vector valued function?

What is a velocity vector?

What is an acceleration vector?

What is speed? (Is it a vector?)

Practice exam 1

This is a practice exam and it does not cover all the material. Solutions will be posted on Wednesday evening.

1. a) Find the equation of a plane containing the points $(1, 2, -1)$, $(2, 3, 2)$ and $(0, 1, 1)$.

b) Describe the intersection of the planes:

i) $3x + 4y - 2z = 0$, $-6x - 8y + 4z - 8 = 0$

ii) $x + y + z + 4 = 0$, $3x - y + 2z = 0$

c) Find the angle between the planes: $x + 2y + 5z = 0$ and $4x + 3y + z + 4 = 0$.

2. a) A line goes through the points $(1, 2, 0)$ and $(2, 3, 1)$, give parametric and symmetric equations for this line. (Food for thought: There are several solutions for the parametric equations. How can they differ?)

b) Find the distance from the point $(1, 2, 3)$ to the line $\frac{x-2}{3} = y - 1 = \frac{z-2}{2}$.

c) If a line goes through the point $(-1, -3, 1)$ and has direction $\langle 2, 3, 1 \rangle$ what are the parametric equations for this line?

d) Give an equation of the plane that contains the lines from parts a) and c).

e) Give an equation for a line that is perpendicular to the plane in part d).

3. a) Find unit vectors in the directions of $\vec{a} = \langle 2, 0, -4 \rangle$ and $\vec{b} = \langle 3, 1, 1 \rangle$.

b) Are these vectors perpendicular? If not find a vector that is perpendicular to \vec{a} .

4. a) Graph:

i) $x = t^2$, $y = 1/t^2$

ii) $x = 4 \sin t$, $y = 2 \cos t$

b) Find what values of t make the tangent lines vertical and horizontal.

c) Find the arc length for $x = t^2\sqrt{2}$ and $y = t^2 - t$ when the curve is below the x-axis. (Do not evaluate the integral.)

d) Also, find the area in between the curve and the x-axis.