

Project I Cover Sheet

This page must be stapled in front of your project

This part to be used by grader:

No. of correct problems:_____ out of 11

Project Grade_____ out of 10 pts.

Name: _____

Project Check List:

Answers are boxed ☐

Formulas are boxed ☐

Sketches are provided when required ☐

Final answers in fraction form (not converted to decimals) ☐

Project stapled together with first page cover sheet ☐

Project I

In Project I you will work with:

I. Properly identifying mathematical objects:

- a) It is very important to be able to distinguish between a *vector* and a *number*. The dot product of two vectors is a *number* (often also referred to as a *scalar*). The cross product of two vectors is a vector.

In this part make sure that *the result of the dot product is not written in vector form*.

Problem 1: 9.3 # 4

Problem 2: 9.4 # 18

- b) Equation of a line: You should be able to write parametric equations of a line aligned to a vector $\mathbf{v} = a\mathbf{i} + b\mathbf{j} + c\mathbf{k}$ and passing through a point $P(x_0, y_0, z_0)$.

Problem 3: 9.5 # 20 (only the parametric equation).

- c) Equation of a plane in standard form: $Ax + By + Cz + D = 0$.
You must know that a normal vector to this plane is

$$\mathbf{N} = A\mathbf{i} + B\mathbf{j} + C\mathbf{k}$$

Problem 4: 9.6 # 22

- d) You should be able to sketch and identify quadric surfaces.

Problem 5: 9.7 # 14

Problem 6: 9.7 # 17

II. Constants of integration: In the following problem you should figure out how to use the data given in the problem to find the value of the constants of integration.

Problem 7: 10.2 # 36

III. The purpose of the following problems is to help you realize that all the curvature formulas give the same result. So you do not need to memorize all of them, but rather know how to use them.

Do the following problems using the formula $\kappa = \frac{||\mathbf{T}'(t)||}{||\mathbf{R}'(t)||}$.

Problem 8: Find the curvature of the plane curve $y = x^2$.

Hint: use a parametrization with $x = t$.

Problem 9: Find the curvature of a circle of radius 4. Hint: use a parametrization with $x = 2\cos(t)$, $y = 2\sin(t)$.

IV. Understanding the meaning of partial derivatives:

Problem 10: 11.3 # 32 a)

Problem 11: 11.3 # 32 b)