MATH 222 SPRING 2017

FINAL EXAM

Your name:

Recitation instructor name:

Recitation time:

Problem	1	2	3	4	5	Total
Grade						

Problem 1. (20 pts) Let L denote the line given by the parametric equation

$$r(t) = (2 + 2t)i + (3 + t)j + (1 + 2t)k.$$

a) Find the distance from L to the origin.

b) Find an equation of the plane which contains both the origin and the line L.

Problem 2. (20 pts) Let Γ denote the curve given by the parametric equation

$$r(t) = 3ti + 4\cos(t)j + 4\sin(t)k, \quad 0 \leq t \leq 1.$$

a) Find the length of Γ.

b) Find the curvature of Γ.

Problem 3. (20 pts) Let D denote the closed triangular domain

$$D = \{(x, y) \,|\, x \geq 0, y \geq 0, 2x + y \leq 2\}.$$

Find the maximal and minimal values of the function

$$f(x, y) = x^2 + 2xy - y^2$$

in the domain D.

Problem 4. (20 pts)
a) Compute the integral

$$\iint_D (x^2 + y^2)^3 dxdy,$$

where D is the unit disk centered at the origin.

b) Use Green's theorem to compute the line integral

$$\oint_\Gamma (\cos(x^2) + e^y)dx + (e^x + \sin(y^2))dy,$$

where Γ is the square with the verices $(0, 0), (0, 10), (10, 10), (10, 0)$.

Problem 5. (20 pts) Is the vector field

$$F(x, y, z) = (2x + yz)i + (2y + xz)j + (2z + xy)k$$

conservative? If yes, find a function $f(x, y, z)$ such that $\nabla f = F$.