MA 182

Final Exam

Prof. NaughtonShow all work for full credit.Only scientific calculators without graphing capabilities are allowed.

Name in capitals:

1. Use Lagrange multipliers to find the extreme values of f(x, y, z) = 8x - 4z subject to the condition $x^2 + 10y^2 + z^2 = 5$.

2. Find the points on the surface $(y + z)^2 + (z - x)^2 = 16$ where the normal line is parallel to the yz-plane.

3. Given a parametrization $\vec{r}(t)$ of a space curve C, state formulas for $\vec{T}(t)$, $\vec{N}(t)$, $\vec{B}(t)$, arc length from t = a to t = b, and curvature $\kappa(t)$.

- 4. A blue plane B: x + 3y 2z = 6 and a yellow plane Y: 2x + y + z = 3intersect in a grenn line G. a) If you stand at P(1, -2, -1) and look in the direction $\vec{v} = \langle 1, 2, 1 \rangle$, what color do you see?
 - b) Find a parametrization of G.
 - c) What directions should you look to see G?

Answers:

5. Let $\vec{F}(x, y, z) = \langle 3x^2yz - 3y, x^3z - 3x, x^3y + 2z \rangle$. Find curl \vec{F} . Compute the work done by \vec{F} in moving a particle from A(0, 0, 2) to B(0, 3, 0) along the curve in the diagram: 6. Calculate the outward flux of the vector field $\vec{F}(x, y, z) = \langle x^3, y^3, z^3 \rangle$ across the surface of the solid bounded by the cylinder $x^2 + y^2 = 1$, z = 0, and z = 2. 7. Sketch the curve C: $\vec{r}(t) = \langle \cos t, \sin t, \sin t \rangle, 0 \le t \le 2\pi$. Find $\oint_C 2xe^{2y} dx + (2x^2e^{2y} + 2y \cot z) dy - y^2 \csc^2 z dz$.

8. Express the volume of the tetrahedron bounded by the planes x + 2y + z = 2, x + 2y, x = 0, z = 0 as an iterated triple integral. Do not evaluate the integral.