CALCULUS 211-FINAL EXAM-DECEMBER 15, 2004

1)Determine the equation of the plane formed by the intersecting lines
$\frac{x-1}{2} = \frac{y-2}{1} = \frac{z+1}{4} = t$ and $\frac{1-x}{1} = \frac{2-y}{2} = \frac{z+1}{2} = t$

2)Evaluate $\frac{\partial z}{\partial x}$ at the point (2,2,1) for the surface $x\ln z + xyz^2 + zy = 5$

3)Determine, for $w = x^2y^3\sin z + x$ at the point $(2, 1, \frac{\pi}{6})$
a)Maximum value of the directional derivative $\frac{dw}{ds}$
b)The equation of the plane tangent to the surface $x^2y^3\sin z + x = 4$ at the same point

4)For a point moving along the space curve $x = t^2 + 1$, $y = \cos t$, $z = e^{2t}$
determine the cosine of the angle between the position and acceleration vectors, at t=0

5)Find the critical points and classify them for $z = x^4 - 8x^2 + y^2 - 4y$

6)Using Lagrange multipliers, find the point on the line $y = -2x + 4$ that is closest to point (0,1)
(hint: minimize the square of the distance between the points)

7)Evaluate the double integral $\int_0^1 \int_{\sqrt{x}}^1 (\frac{1}{\sqrt{1+y^3}})dydx$ by reversing the order of integration

8)Evaluate the volume in the region bounded by the parabolic cylinder $y = x^2$ and the planes
$y + z = 1$ and $z = 0$, by evaluating the volume integral $\left(\iiint dV\right)$

9)a)Determine the potential of the conservative vector field $\mathbf{F} = xz^2\mathbf{i} + 2y\mathbf{j} + x^2z\mathbf{k}$
b)Evaluate the work done by this vector field in moving along an object from
the point (0,0,1) to (1,2,1)

10) For the space curve $x = t^2 + 1$, $y = \frac{t^4}{4}$, $z = t^3 - 1$
evaluate the line integral $\int_c \mathbf{F} \cdot d\mathbf{R}$ for $\mathbf{F} = 5y\mathbf{i} + 7z\mathbf{j} + x\mathbf{k}$ between $0 \leq t \leq 1$

11) For the vector field $\mathbf{F} = -y\mathbf{i} + xy\mathbf{j}$ evaluate as a line integral $\oint \mathbf{F} \cdot d\mathbf{R} = \oint -ydx + xydy$

around the region enclosed by the curves $y = 4x$ and $y = x^3$ in the first octant.

12) Using Greens Theorem evaluate the integral $\oint \mathbf{F} \cdot d\mathbf{R}$ in problem (11)
by double integration.