Conte

FINAL EXAM MATH 233 SUMMER 2013

1. Given that the position vector of some particle in motion is given by

$$r(t) = (\frac{1}{1+t^2}, \frac{t}{1+t^2}, 4t)$$

a) Calculate the velocity

b) Calculate the acceleration

c) What is the tangential component of the acceleration when t=2?

2. Answer each of the following for the surface parametrized by $\Phi(u, v) = (9u^2 - 4v^2, 3u + 2v, 3u - 2v)$

a) Compute the equation for the normal to the tangent planes

b) Find the equation of the tangent plane at the point determined by (u,v)=(-2,3)

3. Let $\mathbf{F}$=$(2x \ln y + e^z, \frac{x^2}{y}, xe^z$ and $\phi(x, y, z) = x^2 \ln y + xe^z$

a) Verify that $\mathbf{F}$=$\nabla\phi$

b) Evaluate the line integral of $\mathbf{F}$ over the path $c(t) = (t+1, e^t, t^2)$ for $0 \leq t \leq 2$

4. Evaluate the double integral $\int\int f(x,y,z)\, dxdy$ for the function $f(x,y) = 2xy^2$ over the region $1 \leq x^2 + y^2 \leq 4$, $x \geq 0$(Hint: use polar coordinates!). Sketch the region

5. Answer each of the following for $g(x,y) = \ln(y - 2x)$

a) Compute the directionl derivative $\nabla g \cdot v$ in the direction $\mathbf{v}=(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2})$ at the point (2,7)

b) State and sketch the domain

c) Graph the level sets for $c = 0$, $c = -2$, and $c = 2$

6. Integrate $f(x, y) = 5xy$ over be the region D shown by using the change of variables $\phi(u, v) = (4u - 3v, 6u)$ and integrating over D_0=[0,1]x[0,1] instead.

7. Find the critical points of $f(x, y) = 2x^4 + 2y^4 - 8xy$. Use the 2nd derivative test to determine if the critical points are relative maximums or minimums, saddle points or if the test is inconclusive.

8. Use Green's Theorem to compute the line integral $\int \mathbf{F} \cdot \mathbf{ds}$ where $\mathbf{F}$ $=(2xy, x+10)$ and C is the path shown

9. Use the Divergence Theorem to evaluate the surface integral

$$\int\int F \cdot dS$$

Where S is the boundary of the cube $0 \leq x, y, z \leq 6$ and $\mathbf{F}=(z^2, 3y, z^3)$