Conte, Spring '15

1 = 15 pts   2–8 12 pts

FINAL EXAM A   MATH 233

1. Given the vectors $\mathbf{u}=(2,1,-2)$ $\mathbf{v}=(0,1,1)$ and $\mathbf{w}=(4,0,-2)$ answer each of the following

a) Simplify the linear combination $3\mathbf{u}-\mathbf{v}-5\mathbf{w}$

b) Find the vector of length 5 in the opposite direction of $\mathbf{w}$

c) Find the volume of the parallelpiped spanned by the 3 vectors

2. For the vector valued function $\mathbf{r}(\mathrm{t})=(\cos 4t, \sin 4t, 9t)$ answer each of the following:

a) The equation of the tangent line to the curve at the point determined by $t = \pi/2$.

b) Find the arc-length parametrization of the curve.

3. Find the equation of the tangent plan to the surface parametrized by $\Phi(u, v) = (9u^2 - 4v^2, 3u + 2v, 3u - 2v)$ at (2,1) (use the back of the page)

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

a) Verify that $\mathbf{F}$=∇V

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

5. Use the Divergence Theorem to evaluate the surface integral

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

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

6. Use Green's Theorem to compute the line integral $\int_C \mathbf{F} \cdot \mathbf{ds}$ where $\mathbf{F}=(2xy, x+10)$ where C is the boundary of the triangle with vertices (0,0), (5,0) and (5,3).

7. Evaluate the integral of the function $f(x,y,z) = xy^2 - z$ over the region $1 \leq x^2 + y^2 \leq 4$, $x \geq 0, 0 \leq z \leq 4$
(Hint: use cylindrical coordinates!).

8. Find the critical point of $f(x, y) = \frac{1}{4}x^4 + 8x + e^{y^2-10y}$. Use the 2nd derivative test to determine if what kind or if the test is inconclusive.