Test #1B 100 points Math 200 Name:______________________________________

Show work

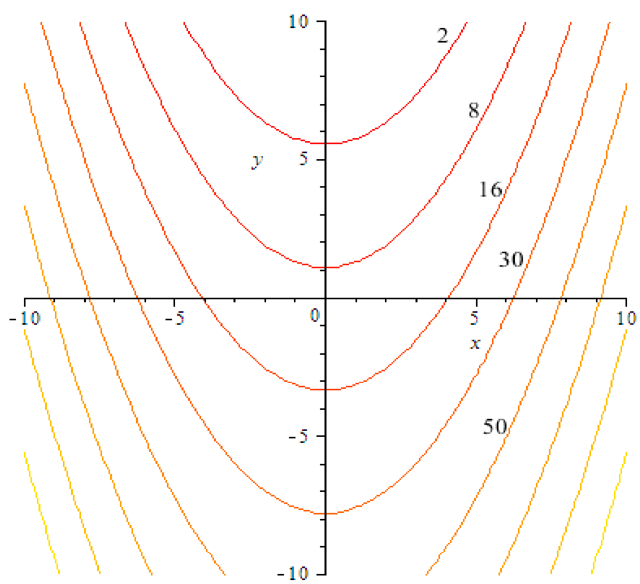
1) Find an integral that represents the work done by the force $\vec{F} = \langle 3, x, y \rangle$ on a particle that moves on the helix parameterized by $\vec{r}(t) = \langle \cos t, \sin t, t \rangle$ from $t = 0$ to $t = \frac{3\pi}{2}$, and then **evaluate the integral**. (10 points)

2) Find an integral that represents the mass of the wire that lies on $y = x^2$ from $(0,0)$ to $(1,1)$ in the xy - plane if its linear density is $\delta(x, y) = 8x$, and then **evaluate the integral.** (10 points)

3) Find a parameterization for the circle that lies in the plane z = 5 with radius 2 that is centered at (2, 5, 5).
(5 points)

4) Does the line determined by the points $(6,1,-2)$ and $(4,-3,1)$ intersect $3x-4y+z=-1$? If so, then where? If not, then explain how you know. (10 points)

5) Use the contour plot of f(x, y) to estimate $f_x(4,0)$. Draw an appropriate segment. (6 points)



6a) Find all second partial derivatives of $f(x,y)=x\cos(y)-\ln(y+2x)$. (5 points)

6b) What is $\nabla f(1,0)$? (4 points)

7a) A curve is parameterized by $\vec{r}(t) = \langle \cos(2t), \sin(2t), t \rangle$. Find the curvature of the path when $t = \frac{\pi}{2}$.
(10 points)

7b) $\vec{r}(t) = \langle \cos(2t), \sin(2t), t \rangle$ as in #7a. Suppose $\vec{w}(\pi/2) = \langle 1,1,1 \rangle$ and $\vec{w}'(\pi/2) = \langle 1,0,1 \rangle$. Find and simplify $\left. \frac{d(\vec{w} \cdot \vec{r}')}{dt} \right|_{t=\pi/2}$. Show work. (5 points)

8) Evaluate $\int_C (2x - 3y)\,dx + x\,dy$ if C is the curve that moves on a line from (0, 2) to (0, 5) and then on a line from (0, 5) to (5, 5). (10 points)

9) Let $\vec{v} = \langle 1, 2, 1 \rangle$ and $\vec{w} = 2\hat{\mathbf{i}} - 2\hat{\mathbf{j}} + \hat{\mathbf{k}}$. You may use work from one part to solve other parts. (20 points)

A) Find the plane parallel to $\vec{v}$ and $\vec{w}$ that passes through (0, 0, 0). Use standard form for your answer.

B) Find the area of the **triangle** determined by $\vec{v}$ and $\vec{w}$.

C) Find the flux of the force $\vec{F} = \langle 1, -3, 2 \rangle$ through the parallelogram determined by $\vec{v}$ and $\vec{w}$, and oriented from $\vec{v}$ to $\vec{w}$ by the right hand rule. (Units: g/m^2.)

D) Find the component of $\vec{v}$ on $\vec{w}$.

10) Sketch the **surface** corresponding to $y^2 + z^2 = 4$. Label the axes. (5 points)