Test #1 100 points Math 200 Name:____________________

Show work

1) Let $\vec{v} = \langle 1,2,1 \rangle$ and $\vec{w} = \langle 2,2,1 \rangle$. (15 points)

A) Find the work done by the force $\vec{v}$ on a particle as it is displaced along the vector $\vec{w}$.

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

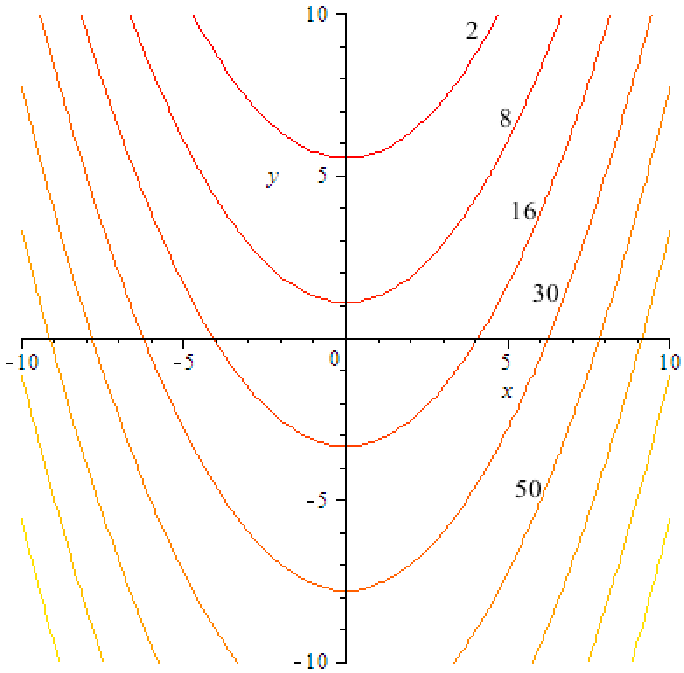
C) Find the area of the triangle determined by $\vec{v}$ and $\vec{w}$.

D) Find the flux of the force $\vec{F} = \langle 1,5,2 \rangle$ through the parallelogram determined by $\vec{v}$ and $\vec{w}$ and oriented from $\vec{v}$ to $\vec{w}$ by the right hand rule.

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

2) 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)

3) Use the contour plot of f(x, y) to estimate $f_x(4,0)$ and $f_y(4,0)$. Show work and draw the appropriate segments on the contour plot. (8 points)



4) Find all first and second partial derivatives of $f(x, y) = \cos(xy) + e^{2xy}$. (8 points)

5) Find the equation of the plane determined by the points $P = (0,1,-1)$, $Q = (2,1,3)$, and $R = (-1,2,0)$. Write your final answer in ax + by + cz = d form. (8 points)

6) 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. (8 points)

7) What is the cosine of the angle between the planes x - y + z = 6 and x + y + z = 2? (4 points)

8) Draw the contour plot for $z = x^2 - y^2$. Label at least 8 continuous curves and distribute them equally through out the quadrants. (5 points)

9) 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**. (8 points)

10) Find an integral that represents the mass of the wire that lies on $y = x^2$ from $(1,1)$ to $(2,4)$ in the xy - plane if its linear density is $\delta(x, y) = 8x$, and then **evaluate the integral.** (8 points)

11) Evaluate $\int_C (2x - 3y)\,dx + x\,dy$ if C is the curve that moves from (0, 0) to (1, 0) to (0, 2) to (0, 0) along the perimeter of the triangle with vertices (0, 0), (1, 0), and (0, 2). (8 points)

12) A curve is parameterized by $\vec{r}(t) = \langle \cos(2t), \sin(2t), t \rangle$.

a) Find the curvature of the path when $t = \dfrac{\pi}{2}$. (6 points)

b) Calculate $\vec{v}(t) \cdot \vec{a}(t)$. What can you conclude about the velocity and acceleration vectors? (4 points)

13) Suppose the path of a particle parameterized by $\vec{r}(t)$ has the property that $\vec{r}(t) \times \vec{v}(t) = \langle 1, 2, 2 \rangle$ for all values of t. Use the product rule to prove that $\vec{r}(t)$ and $\vec{a}(t)$ are parallel for all values of t. (5 points)