			Mатн 25	13, Fall 200	8	
	FINAL EXAM				DECEMBER 17, 2008	
	STUDENT'S NAME:			ID #:		
	Please cir	cle your instruct	or's name:	Rangipour	Jones	Seahra
		Note: You n		work in order to r devices are allow		•
(3)		Find the equation $(2, 1, -1)$.	of the tangent pla	one to the surface x^2	$-2y^2 + z^2 + yz = 1$	2 at the point
(4)	(b) F	Find the direction $\overrightarrow{v} = \langle -1, -2, 2 \rangle$.	al derivative of F	$f(x,y,z) = \sqrt{xyz}$ at t	the point $(3, 2, 6)$ in	the direction

(c) Use the chain rule to find $\frac{\partial z}{\partial t}$ if $z = \sin \theta \cos \phi$ with $\theta = st^2$ and $\phi = s^2t$.

(5) 2. (a) Find and classify all local maxima, local minima, and saddle points of

$$f(x,y) = x^3 + xy^2 + 6x^2 + y^2.$$

(5) (b) Let f(x, y, z) = 8x - 4z. Use Lagrange Multipliers to find the maximum and minimum values for f subject to the constraint $x^2 + 10y^2 + z^2 = 5$.

(5) 3. (a) Sketch the region of integration, change the order of integration and evaluate $\int_0^1 \int_{x^2}^1 x \sqrt{1+y^2} dy dx$.

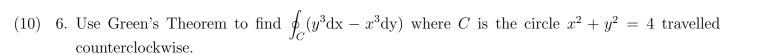
(5) Use polar coordinates to evaluate $\iint_R \frac{y}{x} dA$ where R is the region in the first quadrant which is inside the circle $x^2 + y^2 = 2x$.

(5) 4. (a) Use cylindrical coordinates to evaluate $\iiint_R \sqrt{x^2 + y^2} dV$ where R is the region bounded below by the paraboloid $z = x^2 + y^2$ and above by the plane z = 4.

(5) Use spherical coordinates to evaluate $\iiint_E z dV$ where E is the solid that lies below the sphere $x^2 + y^2 + z^2 = 1$ and above the cone $z^2 = x^2 + y^2$, in the first octant.

(4) 5. (a) Evaluate $\int_C ((x+yz)dx + 2xdy + xyzdz)$ along the arc C given by $x=t,\ y=t^2,\ z=t^3,\ 0\leq t\leq 1.$

(6) (b) Show that $\overrightarrow{F}(x,y) = \langle e^x \sin y, e^x \cos y + \sin y \rangle$ is conservative and find a function ϕ such that $\overrightarrow{F} = \nabla \phi$. Use ϕ to evaluate $\int_C \overrightarrow{F} \cdot d\overrightarrow{r}$ where C is the arc of an ellipse going from (0,0) to $(-1,\frac{\pi}{4})$.



(8) 7. (a) Given that $\overrightarrow{F} = \langle x^2yz, xy^2z, xyz^2 \rangle$, find the divergence and curl of \overrightarrow{F} .

(2) (b) Is it possible to express \overrightarrow{F} of part (a) as the gradient of a function f?

(5) 8. (a) Use Stokes' Theorem to evaluate $\oint_C \overrightarrow{F} \cdot d\overrightarrow{r}$ where $\overrightarrow{F} = \langle 3, z^2, yz \rangle = 3\overrightarrow{i} + z^2\overrightarrow{j} + yz\overrightarrow{k}$ and C is the boundary of the paraboloid $y = 4 - x^2 - z^2$ in the first quadrant travelled clockwise as viewed from the origin.

(5) (b) Find the curvature of $\overrightarrow{r}(t) = e^t \cos t \overrightarrow{i} + e^t \sin t \overrightarrow{j} + t \overrightarrow{k}$ when t = 0.

(10) 9. Use divergence theorem to compute the flux of $\overrightarrow{F} = 2x^3z\overrightarrow{i} + 2y^3z\overrightarrow{j} + 3z^2\overrightarrow{k}$ across the sphere $x^2 + y^2 + z^2 = 4$, oriented outward.