Math2204: Written HW8 (Due Friday 4/11, 5pm)

No calculator or other electronic devices for written HWs.

Include a formula you use in the write-up of that problem.

Hand in **ALL WORK AND REASONING** for the following problems.

- **Section 14.5**: 7, 13, 19, 27, 39, 43a.
- **Section 14.6**: 17, 23, 31, 41, 51a.
- **Section 14.7**: 1a, 1b, 2c.

A) Let $z(x,y) = \mathrm{e}^{xy^2}$, $x(s,t) = 2s - t$, and $y(s,t) = s^2t^2$.

Use the multivariable chain rule to find $\partial z/\partial t(1,2)$. **No credit for other methods**.

B) Let $w = y/x^2 + z$, $x = t^2\mathrm{e}^{2t}$, $y = \sqrt{1+4t^2}$, and $z = \ln(1+t)$.

Use the multivariable chain rule to find $\mathrm{d}w/\mathrm{d}t$. **No credit for other methods**.

C) Let $x^2 + z^3 = y^2z$.

1. Find $\partial z/\partial y$ using Eq. (6) of Sec. 14.5.
2. Find $\partial z/\partial y$ using implicit differentiation of Sec. 14.3 (See 14.3 notes or textbook Ex.5).

D) Let $f(x,y) = y\mathrm{e}^{xy^2}$ and P be $(0,2)$.

1. Find the rate of change of f at P in the direction of the vector $\langle -1,\ 1\rangle$.
2. In which direction does f increase most rapidly at P?
3. What is the maximum rate of change of f at P?

E) Let $x^4y^3 + yz^3 = x^2 + z^2$.

1. Find an equation for the tangent plane at $(1,1,1)$.
2. Find an equation for the normal line at $(1,1,1)$.

F) Find all **critical points** of

1. $f(x,y) = x^2 - x^2y - y^2 + y^3$.
2. $f(x,y) = x^4 + x^2 - y$.

G)

(a,b)	$f(a,b)$	$f_x(a,b)$	$f_y(a,b)$	$f_{xx}(a,b)$	$f_{yy}(a,b)$	$f_{xy}(a,b)$
$(2,0)$	-1	0	0	2	2	1
$(0,0)$	0	2	0	-2	-3	1

Let $f(x,y)$ have continuous second partial derivatives. Determine for each point (a,b):

1. Is the given point a saddle point?
2. Does f have a local maximum or minimum at (a,b)?