Name: _____

I commit to uphold the ideals of honor and integrity by refusing to betray the trust bestowed upon me as a member of the Georgia Tech community. By signing my name below I pledge that I have neither given nor received help on this exam.

Pledged: _____

Problem	Possible Score	Earned Score
1	18	
2	18	
3	18	
4	16	
5	15	
6	15	
Total	100	

Remember that you must SHOW YOUR WORK to receive credit!

Good luck!

1. [18 points] Find an equation for the plane tangent to the surface:

$$-8\cos(\pi x) + 5x^2 y + 5e^{xz} + 4yz = 18,$$

at the point $P_0(1, 1, 0)$. Express the equation in the form $Ax + By + Cz = D$.

2. [18 points] Find the direction(s) $\mathbf{u}$ for which the directional derivative $D_{\mathbf{u}}f(1, -1) = 0$, where

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

3. [18 points] Find all the critical points of the function

$$f(x, y) = 8x^2 + 4x^2y + y^2 - 7,$$

and classify each one as a local maximum, a local minimum, or a saddle point.

$$f(x, y) = 8x^2 + 4x^2y + y^2 - 7,$$

4. [16 points] Evaluate the integral:

$$\int_0^{2\sqrt{\ln 6}} \int_{y/2}^{\sqrt{\ln 6}} e^{x^2} \, dx \, dy.$$

5. [15 points] Evaluate the integral:

$$\int_1^2 \int_0^x \frac{1}{(x^2 + y^2)^{3/2}} \, dy \, dx.$$

6. [15 points] Find the point(s) on the surface $z^2 = xy + 4$ which are closest to the origin.