Calculus III (Math 273, Section 2) – Fall 2014
Exam 2

Name: ____

WSU ID: ______________________________________

- There are **eight** problems and **four** pages in this exam.
- Show all work, and provide appropriate **justifications** where required.
- Calculators, cell phones, laptops, or any other electronic devices are **not** allowed.
- Good luck!

1	2	3	4	5	6	7	8	Total

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1. **(14)** Find the equation for the plane tangent to the surface $z = x^2 + y^2 - 1$ at the point $P_0(1, 2, 4)$. Also find the equation to the line normal to the given surface at P_0.

2. **(12)** The area of the ellipse $(x/a)^2 + (y/b)^2 = 1$ is given by $A = \pi ab$. If $a = 10$ **cm** and $b = 5$ **cm** as measured **to the nearest millimeter**, what is the percentage error in the calculated area?

3. **(12)** Find the parametric equation for the line tangent to the curve of intersection of the two surfaces $2x^2 + y^2 + 3z = 6$ and $x = 1$ at $P_0(1, 1, 1)$.

4. **(14)** Find all local minima, local maxima, and saddle points of the function given below. You should evaluate the function at each critical point.

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

5. **(16)** Find the absolute maximum and minimum values of $f(x,y) = 4xy - 3x^3 - 2y^2$ on the region R that is the part of the x-axis connecting the points $(1,0)$ and $(4,0)$.

6. **(12)** Evaluate the double integral over the given region R.

$$\iint_R \frac{xy^3}{x^2+1}\,dA, \qquad\qquad R:\ 0 \le x \le 1,\quad 0 \le y \le 2.$$

7. **(14)** Sketch the region of integration, and write an equivalent integral with the order of integration reversed. Then evaluate this reverse ordered integral.

$$\int_{0}^{3} \int_{\sqrt{x/3}}^{1} e^{y^3}\, dydx.$$

8. **(6)** Decide whether each of the following statements is *True* or *False*. **Justify** your answer.

   (a) A saddle point of a function cannot be on the boundary of its domain.

   (b) Reversing the order of integration of a double integral is equivalent to swapping x and y in the integral, i.e., replace every occurrence of x in the integral with y, and vice versa.