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

- Show all work, and provide appropriate **justifications** where required.
- Calculators, cell phones, laptops, or any other electronic devices are **not** allowed.
- Good luck!

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

2. **(12)** Find the parametric equation for the line tangent to the curve of intersection of the two surfaces $x^2 + y + 2z = 4$ and $y = 1$ at $P_0(1, 1, 1)$.

3. **(12)** Let $y = uv$. If u is measured with an error of 2% and v is measured with an error of 3%, estimate the percentage error in the calculated value of y.

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.

$$f(x, y) = x^3 + y^3 - 3xy + 15.$$

5. **(16)** Find the absolute maximum and minimum values of $f(x, y) = x^2 + xy + y^2 - 3x + 3y$ on the region R that is the part of the line $x + y = 4$ lying in the first quadrant.

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

$$\iint_R xye^{xy^2}\, dA, \qquad R:\ 0 \le x \le 2,\ \ 0 \le y \le 1.$$

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

$$\int_0^1 \int_{x^2}^{x} \sqrt{x}\, dydx.$$

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

   (a) A point that gives the absolute maximum of a function in a given region R must also be a local maximum of the function.

   (b) Swapping the lower and upper limits of both integrals in a double integral leaves the value of the double integral unchanged.