MATH 126, SECTIONS C AND D, AUTUMN 2016, MIDTERM II
NOVEMBER 17, 2016

Name____

TA/Section____

Instructions.

- There are 4 questions. The exam is out of 40 points.
- You are allowed to use one page of notes written only on one side of the sheet in your own handwriting. **Hand in your notes with your exam paper.**
- You may use a TI 30X IIS calculator. Even if you have a calculator, give me exact answers. ($\frac{2\ln 3}{\pi}$ is exact, 0.7 is an approximation for the same number.)
- **Show your work**. If I cannot read or follow your work, I cannot grade it. You may not get full credit for a right answer if your answer is not justified by your work. If you continue at the back of a page, make a note for me. Please $\boxed{\text{BOX}}$ your final answer.

Question	points
1	
2	
3	
4	
Total	

1. (10 points) The vector function $\mathbf{r}(t) = \left\langle 2t, 3t^2, t^3 \right\rangle$ sketches a curve in space. Compute the following at the point where $t = 1$.

   (a) The equation of the normal plane.

   (b) The curvature κ.

   (c) The unit normal vector $\mathbf{N}$.

2. (8 points) A surface is given by the equation $\cos^2(x - 2y) + y^2 = 2e^z + z$.

(a) Use implicit differentiation to compute the partial derivatives z_x and z_y.

(b) Write down the equation of the tangent plane to this surface at the point $(2, 1, 0)$.

(c) Use linear approximation to approximate the value of z when $x = 1.95$ and $y = 1.01$.

3. (12 points) Find and classify all critical points of the function

$$f(x, y) = 2xy + \frac{15}{4}x + \frac{1}{y} + \frac{1}{8}\ln x.$$

4. (10 points) D is the region in the first quadrant which is above the curve $y = x^3$, to the right of the line $y = 8x$ and below the horizontal line $y = 8$.

(a) Sketch the region D.

(b) Set up the integral $\int\int_D (2x)dA$ integrating with respect to x first. You may have to split the integral into two parts. Evaluate the integral(s).

(c) Set up the integral $\int\int_D (2x)dA$ integrating with respect to y first. You may have to split the integral into two parts. Evaluate the integral(s).