13.4-14.2 HOMEWORK

Graded by Learning Assistant Enzo De Oliveira.

I numbered the problems from each section and used a random number generator to select one problem from each section for 3 problems . The final problem was randomly selected out of all problems The questions graded were

- Section 13.5: 3
- Section 14.1: 11
- Section 14.1: 31
- Section 14.2: 33

Each question was out of 20 points, for a total of 80 points for accuracy. Another 20 points was awarded for neatness, legibility, work, stapling etc.

1. Section 13.5: 3

Write $\mathbf{a}$ in the form $\mathbf{a} = a_T\mathbf{T} + a_N\mathbf{N}$ at the given value of t without finding $\mathbf{T}$ and $\mathbf{N}$.

$$\mathbf{r}(t) = (t+1)\mathbf{i} + 2t\mathbf{j} + t^2\mathbf{k}$$

Solution:

$$\mathbf{a} = a_T\mathbf{T} + a_N\mathbf{N}$$

$$\mathbf{v} = \frac{d\mathbf{r}}{dt} = \mathbf{i} + 2\mathbf{j} + 2t\mathbf{k}$$

$$|\mathbf{v}| = \sqrt{1^2 + 2^2 + (2t)^2} = \sqrt{5+t^2}$$

$$a_T = \frac{d\mathbf{v}}{dt} = \frac{d(\sqrt{5+t^2})}{dt} = \frac{4t}{\sqrt{5+t^2}}$$

$$a_T(1) = \frac{4}{\sqrt{5+4}} = \frac{4}{3}$$

$$\mathbf{a} = \frac{d\mathbf{v}}{dt} = 2\mathbf{k}$$

$$|\mathbf{a}| = 2$$

$$a_N = \sqrt{|\mathbf{a}|^2 - a_T^2} = \sqrt{4 - 16/9} = \sqrt{20/9} = \frac{2\sqrt{5}}{3}$$

$$\mathbf{a} = \frac{4}{3}\mathbf{T} + \frac{2\sqrt{5}}{3}\mathbf{N}$$

10 points awarded for each correct calculation of a_T and a_N. Final answer, $\mathbf{a}$,was needed to get all credit, not just a_T and a_N.

2. Section 14.1: 11

Find and sketch the domain for the function.

$$f(x,y) = \sqrt{(x^2-4)(y^2-9)}$$

Solution:

$$(x^2-4)(y^2-9) \geq 0$$

$(x^2-4)(y^2-9) \geq 0$ occurs when $(x^2-4) \geq 0$ and $(y^2-9) \geq 0$

or

$$(x^2-4) \leq 0 \text{ and } (y^2-9) \leq 0$$

.

So

$$x^2 \geq 4 \text{ and } y^2 \geq 9$$

or

$$x^2 \leq 4 \text{ and } y^2 \leq 9$$

And

$$x \leq -2 \text{ and } x \geq 2 \text{ and } y \leq -3 \text{ and } y \geq 3$$

or

$$-2 \leq x \leq 2 \text{ and } -3 \leq y \leq 3$$

All points that satisfy the conditions above are in the domain.

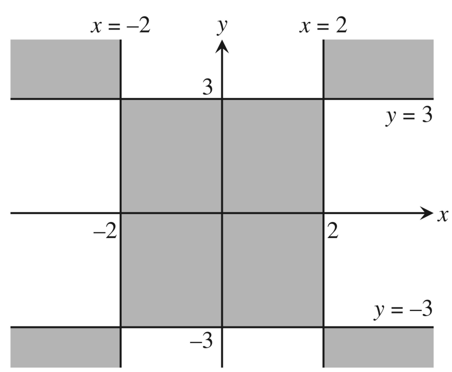

Figure 1. **Domain Graph**

10 points were awarded for correct finding the domain, and elaborating on what points it represented. Stopping on the first line of my solution was not enough. 10 points were awarded for a correctly labeled graph of the domain.

3. Section 14.1: 31

Match each set of level curves with the appropriate graph and appropriate equation.

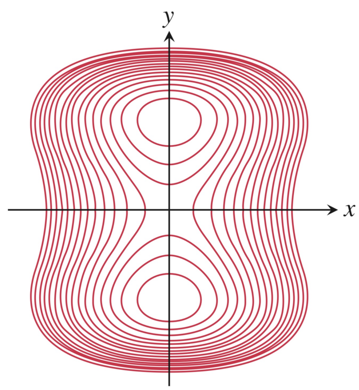

Figure 2. **Level Curve**

Solution:

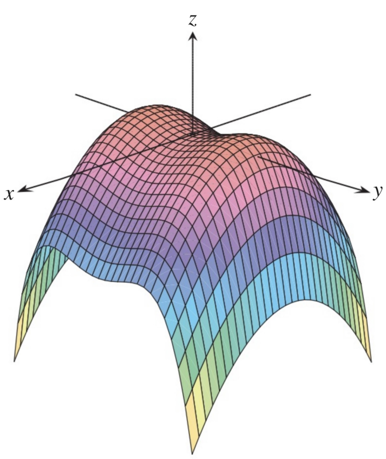

Figure 3. **Function Surface (F)**

Function H: $z = y^2 - y^4 - x^2$

10 points awarded for correctly identifying the surface labeled F. 10 points awarded for correctly identifying the equation labeled H.

4. Section 14.2: 33

At what points (x,y) in the plane are the functions continuous?

a. $f(x, y) = \sin \frac{1}{xy}$

b. $f(x, y) = \frac{x+y}{2+\cos(x)}$

Solution:

a. $f(x, y) = \sin \frac{1}{xy}$

Sine is a continuous function over all real inputs. However, we cannot divide by zero so $f(x, y)$ is continuous on all points (x,y) in R^2 except when $x = 0$ **or** $y = 0$.

b. $f(x, y) = \frac{x+y}{2+\cos(x)}$

Cos(x) ranges from -1 to 1 so $2+\cos(x)$ ranges from 1 to 3, so there is not a domain issue with the denominator. Therefore $f(x, y)$ is continuous at all points (x, y) on R^2.

10 points awarded for correctly identifying the set of points the function was continuous on. Needed to be specific or have reasoning behind your answer.

Common Mistakes and feedback:

- Read the directions to make sure you are doing all the parts.
- When defining the domain, be specific.
- When describing a set of points in multiple variables, make sure you elaborate which variables you're referring to.
- Review your inequalities algebra. Many got it wrong.
- Staple your work so you do not lose any papers.
- If you submitted your paper online, there was no physical feedback to give, only your grade.

If you believe there were any mistakes, or have questions about how I graded your work, feel free to email me or show up to the LA sessions.