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Name: _____

Student ID: _____

Instructor: Asaduzzaman Mohammad

Time: 60 minutes

- Write your name and student ID number in the space provided above
- There are 10 problems on 9 pages (including cover page).
- No books or notes allowed. **No calculators** allowed.
- For all problems (unless otherwise mentioned), you **MUST** show sufficient work to justify your answers. **Partial credits will be awarded for all the right steps. Place your** <u>SIMPLIFIED</u> final answers in the box provided.
- The exam is self-explanatory! Please do not ask the instructor to interpret any question(s)
- Cheating of any form will NOT be tolerated!!
- Remember to check your answers before turning in the exam!
- Finally, do NOT panic believe in yourself and be confident!! ©



- 1. [8 points] What is the area of the triangle with vertices (1,0,1), (1,1,1), and (0,2,0) [No partial credits for this problem]
 - A) $\frac{1}{2}$ B) $\frac{1}{\sqrt{2}}$ C) 1 D) $\sqrt{2}$ E) None of the above

2. [8 points] Find the limit $\lim_{(x,y)\to(0,0)} \frac{xy}{\sqrt{x^2+y^2}}$

[No partial credits for this problem]

- A) -1
- *B*) 0
- C) $\frac{1}{2}$
- D) 1
- E) The limit does not exist

- 3. [8 points] Use linear approximation of the function $f(x, y) = xy \sqrt{x + y}$ at (1,3) to approximate f(0.9, 3.1). [No partial credits for this problem]
 - A) 1.1
 B) 0.98
 C) 0.93
 D) 0.8
 E) 0.78

4. [8 points] Let $\vec{u} = \langle 3, 2, 1 \rangle$ and $\vec{v} = \langle -1, 0, 1 \rangle$. If $\vec{w} = \langle a, b, c \rangle$ is perpendicular to $\vec{u} \times \vec{v}$, then which of the following hold? A) b = 3a + cB) a = 2b - cC) a = 2c + bD) b = -2a - cE) a + b + c = 0

5. [10 points] Determine whether the lines L_1 and L_2 are parallel, skew, or intersecting. If they intersect, find the point of intersection.

$$L_1: \frac{x}{1} = \frac{y-1}{-1} = \frac{z-2}{3}$$
$$L_2: \frac{x-2}{2} = \frac{y-3}{-2} = \frac{z}{7}$$

6. [14 points] Classify and neatly sketch the surface $\frac{x^2}{4} + y^2 - \frac{z^2}{4} - 1 = 0$





7. [12 points] Reparametrize the curve $\vec{r}(t) = \langle \cos(2t), \sin(2t), 1 \rangle$ with respect to the arc length (s) measured from the point where t = 0 in the direction of increasing t.

- 8. [10 points] Use implicit differentiation to find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$
 - $x^2 y^2 + z^2 2z = 4$



9. [10 points] If $\tan^{-1}(x^2 y) = e^{xy}$, then evaluate $\frac{dy}{dx}$.

10. [12 points] Find the curvature of $\vec{r}(t) = \left\langle \sqrt{2} t, e^t, e^{-t} \right\rangle$

 $\kappa =$