Calculus 3 Final Examination Sample 4 - ANSWERS

courtesy of Dr. Inna Sysoeva, University of Pittsburgh, adapted

Problem 1. Check that the vectors forming opposite sides of $ABCD$ are equal. The area is $14\sqrt{3}$.

Problem 2. The lines intersect at $(1, -2, 2)$.

Problem 3. a) Plane: $x - y - z = 1$;
line: $x = 1 + t,\ y = 1 - t,\ z = -1 - t$
b) $(1, 1, -1)$ and $(-1, 3, -3)$.

Problem 4. $v(t) = t^2 + 2$
$a_T = 2t$
$d = 15$

Problem 5. $\frac{\partial z}{\partial u} = v^2 w, \quad \frac{\partial z}{\partial v} = 2uvw, \quad \frac{\partial z}{\partial w} = uv^2$

Problem 6. Answer for both parts a) and b):
Absolute maximum is 50 at $(-2, 2)$;
Absolute minimum is 2 at $(2, -2)$

Problem 7. $\frac{\pi}{8} - \frac{1}{4}$

Problem 8. a) Not conservative;
b) Conservative; 4

Problem 9. 6

Problem 10. 2